AXIS
CONSULTING, LLC

Environmental
Construction
Petroleum

Centered on Service

January 21, 2007

Mr. Jon Heberer
Hydrogeologist
Department of Commerce
P. O. Box 8044
Madison, WI 53708-8044

RE: Case Closure – Additional Information Request Response
Cottage Groove Road Citgo Quick Mart
4601 Cottage Grove Road
Madison, WI 53716
BRRTS #: 03-13-09680
Commerce#:53716-1301-01

Mr. Heberer:

AXIS Consulting, LLC (AXIS) is pleased submit this additional information regarding the above mentioned site as per the request in letter dated April 24, 2001. It is our understanding that Department of Natural Resources (WDNR) transferred the case file to the Wisconsin Department of Commerce (DCOMM) for regulatory oversight in year 2000. We also understand that DCOMM reviewed the case file and will further consider closure when the requested additional information is submitted for review.

For the sake of simplicity, AXIS follows the following format and presents the items requested in your letter dated April 24, 2001 and provides the answers:

1) Collect at least one round of groundwater samples from the monitoring wells MW-2R, MW-3R, MW-6, MW-7, MW-8 and MW-9 for laboratory analysis of PVOCs and Natural Attenuation parameters, which were analyzed during the sampling event in August 1999. In addition, include laboratory analysis of PAHs for the groundwater samples collected from monitoring wells MW-3R, MW-6 and MW-8. If additional monitoring is required, subsequent sampling may be limited to PVOCs.

Groundwater Analytical Results

As requested by WDCOM, Axis initiated post remediation groundwater monitoring activities on July 18, 2002. The post remediation groundwater monitoring program consisted of three sampling rounds conducted on July 18, 2002, December 3, 2002 and June 25, 2003. Sampling activities were conducted at both on and off-site monitoring well locations for a combination of PVOCs, GRO, PAHs and natural attenuation parameters.

The groundwater analytical results indicate the presence of BETX concentrations at five of the seven groundwater monitoring well locations sampled. Benzene concentrations exceeding the WDNR NR 140 enforcement standards (ES) were reported at monitoring well locations MW-2R, MW-3R, MW-6, MW-7, MW-8, and MW-9. Ethylbenzene concentrations exceeding the WDNR NR 140 ES were reported at monitoring well MW-3R. Ethylbenzene concentrations exceeding the WDNR NR 140 preventive action limits (PALs) were reported at monitoring wells MW-6 and MW-8. Xylenes concentrations exceeding the WDNR NR 140 PALs were reported at monitoring well MW-3R. MTBE concentrations exceeding the WDNR NR 140 PALs were reported at monitoring well MW-2R. Naphthalene concentrations exceeding the WDNR NR 140 PALs were reported at monitoring wells MW-6 and MW-8.

The concentrations of PVOCs in groundwater appear to fluctuate seasonally. However, impacts have not been detected at off-site monitoring well location MW-9 suggesting that the contaminant plume has not progressed towards north. Figure 1 in Attachment presents groundwater monitoring wells. The groundwater analytical results are summarized in Table 1 in Attachment 1. The groundwater analytical laboratory reports are provided in Attachment 2.

In addition to laboratory analysis for PVOCs, testing was also conducted for PAHs and natural attenuation parameters. The analytical results indicate the presence of PAH concentrations at monitoring wells MW-3R, MW-6 and MW-8. The PAH levels present do not exceed current NR 140 groundwater quality standards.

Groundwater Elevations

Groundwater depths were measured during the sampling events and groundwater elevations were computed based on KEY Engineering elevations for the top of PVC casings. The top of PVC casings elevations were measured with respect to a temporary bench mark (TMB) and the summary of groundwater elevations data are presented in Table 2 in Attachment 1. The depth to groundwater in various wells ranged from 11.3 (in MW-2R) to 12.14 (in MW-3R) feet bgs on December 3, 2002 and from 10.78 (in MW-5) to 12.32 (in MW-3R) feet bgs on June 25, 2003. Thus there was some seasonal variation in water table of groundwater during December 2002 to June 2003.

The groundwater elevations of various wells ranged from 88.16 feet above TMB (in MW-7) to 88.71 feet above TMB (in MW-9) on December 3, 2002, and from 87.9 feet above TMB (in MW-7) to 88.59 feet above TMB (in MW-9) on June 25, 2003. These data on water elevations also bring out that groundwater elevations across the site were some what sensitive to seasonal effects. Based on December 3, 2002 and June 25, 2003 elevations, groundwater elevation contours for the site were drawn and these are illustrated in Figure 1 in Attachment 3. As is evident from these contours the direction of groundwater flow is towards west and southwest.

Natural Attenuation

Natural attenuation is a passive remedial approach that depends on natural processes to degrade and dissipate petroleum constituents in soil and groundwater. Some of the processes involved in natural attenuation of petroleum products include aerobic and anaerobic biodegradation, dispersion, volatilization, and adsorption. In general, for petroleum hydrocarbons, biodegradation is the most important natural attenuation mechanism. It is the only natural process that results in actual reduction of petroleum constituent mass.

Oxygen is the primary electron acceptor for aerobic biodegradation processes. However, in situations where oxygen levels are low, other terminal electron acceptors may be utilized for microbial metabolism. Nitrate, iron, manganese and sulfate ions can act as electron acceptors for microbes. Sulphate is utilized as a source of oxygen by microbes when supply of oxygen or nitrate is low.

Nitrates and sulfates are reduced by microbes to derive energy for biodegradation. Similarly, ferric iron (Fe^{+++}) can be reduced to ferrous iron (Fe^{++}) to derive energy for biodegradation.

The groundwater samples from the monitoring wells were also analyzed for dissolved iron, dissolved nitrate and dissolved sulfate, dissolved manganese, and methane to evaluate the status of natural attenuation in the groundwater at the site. The analytical data for natural attenuation parameters are summarized in Table 1 in Attachment 1. The laboratory reports of the analysis are included in Attachment 2.

Iron: The detected concentrations of dissolved iron ranged from 0.068 mg/L in MW-6 to 8.7 mg/L in MW-8. Higher values of iron are noted in the up-gradient well MW-9 (8.4 mg/L) and down gradient well MW-8 (8.7 mg/L). The monitoring well MW-3R is at the contamination source location and the iron values are ranged from 2.6 mg/L to 3 mg/L from December 3, 2002 to June 25, 2003. It appears the dissolved iron levels were decreased at MW-2R, MW-3R, MW-6 and MW-7 as the groundwater moves from MW-9 to MW-7 and MW-8.

Nitrates (NO_3^-): Laboratory tests for determination of NO_3^-, estimated and reported NO_3^- as N. Nitrate concentrations were not detected in groundwater at MW-2R, MW-3R, MW-6, and MW-8. Nitrate values at MW-7 of 4.1 mg/l and at MW-9 of 2.7 mg/L were detected in June 2003 sampling event. These results indicate that nitrates are being used at the wells MW-3R and MW-2R as per the presence of nitrates in up-gradient well MW-9. The groundwater samples from MW-7 and MW-9 contained abundant amounts of nitrate conducive to biodegradation even under anaerobic conditions.

Sulfates: Abundant quantities of SO_4^{--} ranging 10 mg/l in MW-8 to 240 mg/l in MW-2R are present in samples of monitoring wells, MW-2R, MW-3R, MW-6, MW-7, MW-8 and MW-9. This again shows quite favorable conditions for the oxidation of BTEX etc. within the site.

Manganese: Low level quantities of Mn are present in the samples of monitoring wells. These results indicate unfavorable conditions for the oxidation of BTEX etc. within the site.

Methane: Under anaerobic metabolism, BTEX compounds are first oxidized to phenols or organic acids then transferred to long-chain volatile fatty acids, which are finally metabolized to methane and carbon dioxide. However, the degradation rates for each of these compounds can vary considerably. The data on content of methane in groundwater presented in Table 1 do show a range of 6.14 ug/l to 2820 ug/l, indicating favorable conditions for anaerobic biodegradation.

The results of natural attenuation testing for dissolved iron, nitrate, sulfate, and methane in groundwater suggest that conditions at the site are favorable for natural attenuation to occur.

2) Provide a copy of the tank closure assessment report. Provide UST Closure Checklist(s), Tank Inventory Forms, tank disposal documentation and tank sludge disposal documentation.

UST Closure Check list and tank inventory forms are included in Attachment 4. Seven USTs were removed during the UST closure activity on October 7, 1996. Please refer to item E (5) on UST Closure Check List and it indicates that closure assessment omitted because of obvious contamination. You will also find documentation from WRR Environmental and Avganic Industries regarding the sludge disposal. Tanks were removed and disposed by SAG Environmental, Inc, which is no longer in business, therefore AXIS CONSULTING, LLC could not obtain any tank disposal documentation.

3) Provide disposal documentation for the approximately 150 tons of soil that was removed from the site during the UST removals on October 5, 1996.

The UST closure check list and tank inventory forms indicate that the USTs were removed on October 7, 1996 but not on October 5, 1996. Based on the invoices from Sanifill and SAG Environmental, it appears that approximately only 64 tons of contaminated soil was disposed at the landfill during the tank removal. The invoices from Saniffill and SAG Environmental are presented in Attachment 5.

4) Confirm all waste generated during the site activities have been treated or disposed. Include investigation waste disposal documentation.

On November 11, 1996, soil remediation at the Cottage Grove Road Quick Mart was initiated and during the course of remediation, approximately 205 tons of petroleum impacted soil were generated as waste and transported to Sanifill's Deer Track Park recycling and disposal facility. Documentation of the soil disposal is provided in Attachment 6. The impacted soil was generated in proximity to the former UST and service island locations on-site. The excavated soil was encountered in the area of impact identified during site investigation activities completed on-site, the result of which are summarized in various reports previously submitted to the WDNR by Key. Some of the investigative soil waste stored in drums may have been disposed along with the excavated contaminated soil in November 1996.

An invoice from One Step Environmental, Inc provided in Attachment 6 indicates that four (4) soil drums and one (1) groundwater drum were removed and disposed by One Step Environmental, Inc on August 24, 1999.

5) Provide monitoring well abandonment forms for the monitoring wells MW-1, MW-2, MW-3, MW-4 and MW-5.

In previous reports Key Environmental indicated the monitoring wells MW-1 through MW-5 were abandoned during the site upgrade. **Monitoring well MW-5 is present at the site and it was sampled on June 25, 2003 along with the other wells, therefore abandonment form for MW-5 is not prepared.** It should be noted that BETX compounds were not present in the groundwater samples from monitoring well MW-5. Only MTBE was noted at a concentration of 0.85 ug/L, which is very below the NR 140 PAL of 12 ug/L. The well abandonment forms for the monitoring wells MW-1 through MW-4 are included in Attachment 7.

If you have any questions or need further information, please feel free to call me at (414)349-7844.

Sincerely,
AXIS CONSULTING, LLC

Virendra S. Verma
Project Geologist

TABLE 1
SUMMARY OF POST REMEDIATION GROUNDWATER ANALYTICAL RESULTS
CITGO Quick Mart
4601 Cottage Grove Road
Madison, WI 53716

Date	Sample Number	GRO	B	E	T	X	MTBE	1,2,4-Tri	1,3,5-Tri	Iron mg/L	Nitrate mg/L	Sulfate mg/L	Mang. mg/L	Meth.	Benzo	Acen.	1-Meth	Naph.	Phen.
7/18/2002	MW-2R	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/3/2002		NS	1.2	44	2	19	9.1	36	0.5	0.81	0.86	36	0.48	NS	NS	NS	NS	NS	NS
6/25/2003		NS	8	1.4	3.8	150	31	110	20	1.2	<0.50	240	1.1	6.14	NS	NS	NS	NS	NS
7/18/2002	MW-3R	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/3/2002		NS	<1.3	500	34	1900	<1.6	710	120	2.6	<0.50	31	0.34	NS	<0.014	<0.21	60	110	0.51
6/25/2003		NS	6.6	1,300	66	4,600	<4.6	1,600	270	3	<0.50	77	0.37	38.4	<0.039	<0.30	<0.52	<0.31	<0.024
7/18/2002	MW-5	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/3/2002		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
6/25/2003		NS	<0.25	<0.22	<0.11	<0.39	0.85	<0.25	<0.19	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/18/2002	MW-6	3260	17.6	165	3.72	128	2.28	396	58.9	14.8	<0.0500	<10.0	NS	343	NS	NS	NS	NS	NS
12/3/2002		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
6/25/2003		NS	23	380	27	550	<27	960	4.2	0.068	<0.50	11	0.1	2,820	0	<0.26	80	260	0.15
7/18/2002	MW-7	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/3/2002		NS	<0.13	<0.22	<0.20	<0.23	<0.16	<0.22	<0.29	<0.042	1	30	0.0095	NS	NS	NS	NS	NS	NS
6/25/2003		NS	<0.25	<0.22	0.18	0.55	<0.23	<0.25	<0.19	<0.042	4.1	39	0.0039	<1.0	NS	NS	NS	NS	NS
7/18/2002	MW-8	1990	3.54	104	0.848	42.4	0.86	434	32.6	38.7	<0.0500	<10.0	NS	83.6	<0.02	6.54	5.46	<5.0	<5.0
12/3/2002		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
6/25/2003		NS	14	200	3.6	180	<4.2	350	1.2	8.7	<0.50	10	0.15	546	<0.033	<0.25	29	150	0.18
7/18/2002	MW-9	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/3/2002		NS	<3.4	<0.22	<0.20	<0.23	66	<0.22	<0.29	<0.042	<0.50	36	0.62	NS	NS	NS	NS	NS	NS
6/25/2003		NS	<0.25	<0.22	<0.11	<0.39	<6.1	<0.25	<0.19	8.4	2.7	46	0.61	<1.0	NS	NS	NS	NS	NS
NR 140 PAL		NE	0.5	140	200	1000	12	NE	NE	NA	NA	NA	NA	NE	0.02	NE	NE	8	NE
NR 140 ES		NE	5	700	1000	10000	60	NE	NE	NA	NA	NA	NA	NE	0.2	NE	NE	40	NE

Notes:

B = Benzene
E = Ethylbenzene
T = Toluene
X = Total Xylenes
Naph.= Naphthalene
1,2,4-Tri = 1,2,4-Trimethylbenzene
1,3,5-Tri = 1,3,5-Trimethylbenzene

Concentrations in microgram per liter (ug/l)
NE = Standard not established
ND = Parameter not detected
NS = Parameter not analyzed
PAL = NR 140 Preventive Action Limit
ES = NR 140 Enforcement Standard
Bold concentrations exceed NR 140 Enforcement Standard

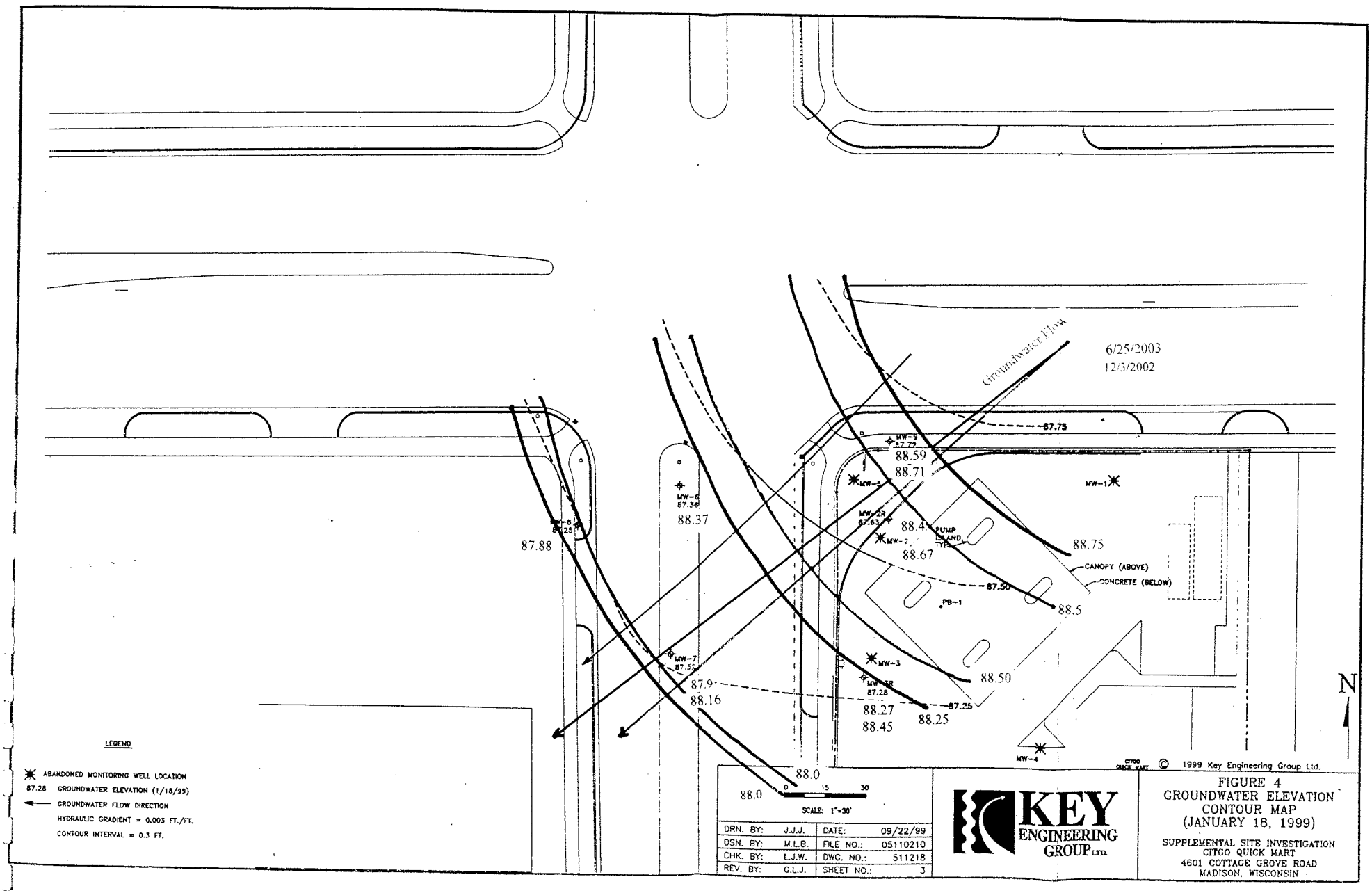
Mang. = Manganese
Meth. = Methane
Acen. = Ancenaphthylene
1-Meth. = 1-Methylnaphthalene
Naph. = Naphthalene
Phen. = Phenanthrene
mg/L = Concentration in milligrams per liter

Benzo = Benzo (a) pyrene

TABLE 2
GROUNDWATER ELEVATIONS
CITGO Quick Mart
4601 Cottage Grove Road
Madison, WI 53716

Date	Well No.	Top of PVC Elevation (feet above TBM)	Depth to Water (Feet)	Groundwater Elevation (Feet above TBM)
7/18/2002	MW-2R	99.970	NS	NA
12/3/2002		99.970	11.3	88.67
6/25/2003		99.970	11.57	88.4
7/18/2002	MW-3R	100.590	NS	NA
12/3/2002		100.590	12.14	88.45
6/25/2003		100.590	12.32	88.27
7/18/2002	MW-5	99.310	NS	NA
12/3/2002		99.310	NS	NA
6/25/2003		99.310	10.78	88.53
7/18/2002	MW-6	99.910	11.34	88.57
12/3/2002		99.910	NS	NA
6/25/2003		99.910	11.54	88.37
7/18/2002	MW-7	99.910	NS	NA
12/3/2002		99.910	11.75	88.16
6/25/2003		99.910	12.01	87.9
7/18/2002	MW-8	99.670	11.72	87.95
12/3/2002		99.670	NS	NA
6/25/2003		99.670	11.79	87.88
7/18/2002	MW-9	100.040	NS	NA
12/3/2002		100.040	11.33	88.71
6/25/2003		100.040	11.45	88.59

Notes: TMB - Temporary Bench Mark
NS - Not Sampled
NA - Not Available



DRN. BY:	J.J.J.	DATE:	09/22/99
DSN. BY:	M.L.B.	FILE NO.:	05110210
CHK. BY:	L.J.W.	DWG. NO.:	511218
REV. BY:	G.L.J.	SHEET NO.:	3

KEY ENGINEERING GROUP LTD.

FIGURE 4
GROUNDWATER ELEVATION CONTOUR MAP
(JANUARY 18, 1999)

SUPPLEMENTAL SITE INVESTIGATION
CITGO QUICK MART
4601 COTTAGE GROVE ROAD
MADISON, WISCONSIN

03-13-076980
Cottage Grove
Quick Mart

KEY ENGINEERING GROUP LTD.
Environmental • Civil/Geotech • Compliance

W66 N215 Commerce Court
Cedarburg, Wisconsin 53012
(414) 375-4750
(800) 645-7365
Fax (414) 375-9680

September 27, 1999

Mr. Michael Schmoller
Hydrogeologist
Wisconsin Department of Natural Resources
Southern District Headquarters
3911 Fish Hatchery Road
Madison, Wisconsin 53711

Reference: *Supplemental Site Investigation Report*
Cottage Grove Road Citgo Quick Mart
4601 Cottage Road
Madison, Wisconsin 53716
WDNR Facility ID #: 03-13-096980
PECFA Claim No. 53716-1301-01
BRRTS #: 03-13-096980

KEY ENGINEERING GROUP, LTD.
File No. 0511021

Dear Mr. Schmoller:

The purpose of this letter is to provide the Wisconsin Department of Natural Resources (WDNR) with the results of the supplemental site investigation (SSI) activities for the above referenced site. This letter was prepared by Key Engineering Group, Ltd. (KEY) on behalf of the site owner, Mr. Ed Francois.

Background Information

Analytical results of a soil sample collected at the Cottage Grove Citgo Quick Mart site located in Madison, Wisconsin during a December 19, 1995 preliminary subsurface investigation indicated that a petroleum release from underground storage tanks (USTs) had occurred. The WDNR was notified and a responsible party letter was issued on January 2, 1996. A site investigation was conducted by KEY between January and September 1996 which included advancing 15 soil borings and converting six borings to groundwater monitoring wells. The site investigation results indicated that on-site and off-site groundwater impacts of petroleum volatile organic compounds (PVOCs) were present at concentrations exceeding their respective NR 140 groundwater quality standards (*Site Investigation/ Remedial Action Options Report,* September 10, 1996).

The site was upgraded and reconstructed in September 1996. The four USTs installed in 1961 and 1973 were removed and two new USTs were installed. Monitoring wells MW-1 through MW-5 were abandoned during the reconstruction of the site. Interim action activities conducted during the UST removal and site reconstruction activities included the removal of approximately 150 tons of petroleum contaminated soils. Two replacement

monitoring wells (MW-2R and MW-3) were installed on October 28, 1997. Groundwater monitoring was performed between October 1997 and August 1999. The WDNR specified in a telephone conversation on November 4, 1997 that groundwater contaminant concentrations were too high for natural attenuation and that active remediation may be required. Additional site investigation activities were required to define the magnitude and extent of off-site groundwater contamination. Therefore, KEY prepared a *Site Investigation Cap Increase Request* dated April 10, 1998 and submitted it to Wisconsin Department of Commerce (WDCOM) for approval. WDCOM denied the *SSI Cap Increase Request* on May 7, 1998. KEY submitted a *Revised SSI Cap Increase Request* on June 19, 1998 with a revised scope of work and this plan was approved by the WDCOM on June 26, 1998.

Objective and Scope of the Supplemental Site Investigation

The objective of the SSI was to define the extent of the off-site groundwater plume and determine if the groundwater plume was expanding. The objective was met by installing three permanent groundwater monitoring wells and four temporary monitoring wells off-site. The site layout map with the monitoring well locations is depicted on Figure 1.

Supplemental Site Investigation Procedures

Three soil borings (B-14, B-15 and B-16) were advanced off-site and converted to groundwater monitoring wells (MW-7, MW-8 and MW-9) by Briohn Environmental Construction on December 8, 1998 (Figure 1). Two soil samples from each boring were analyzed for gasoline range organics (GRO), diesel range organics, lead and volatile organic compounds (VOCs) by Great Lakes Analytical Laboratory. Boring logs are presented in Attachment 1 and monitoring well construction and development forms are presented in Attachment 2.

The wells were surveyed by KEY on January 5, 1999 and on January 18, 1999. The new monitoring wells were developed and the new and existing monitoring wells were sampled. The new monitoring wells were sampled for GRO and VOCs, and the existing wells were sampled for GRO and PVOCs. In addition, all of the wells were sampled for nitrate, sulfate and methane and field measurements of dissolved oxygen (DO), temperature, pH, specific conductance and oxidation-reduction potential (ORP) were made using a Hydrolab DataSonde® 4 and MiniSonde® Water Quality Multiprobe to evaluate whether natural attenuation was occurring at the site.

Four temporary groundwater monitoring wells (GP-1 through GP-4) were installed off-site using a hydraulic probe by Soil Essentials on August 16, 1999. The temporary monitoring wells were sampled for PVOCs and naphthalene by Great Lakes Analytical and the wells were abandoned. Boring logs and borehole abandonment forms are presented in Attachment 1.

The investigation derived waste (soil and groundwater) was contained in Wisconsin Department of Transportation 55-gallon drums and will be disposed of in accordance with applicable regulations.

Supplemental Site Investigation Results

The native soils encountered during the SSI generally consisted of 6 to 8 feet of dark brown silty clay overlying fine to coarse sand with varying amounts of gravel to sandy gravel to an approximate depth of 18 feet below ground surface (bgs), the maximum depth explored.

The depth to groundwater ranged from 12 to 13 feet bgs during the January 18, 1999 sampling event and from 11 to 12 feet bgs on August 16, 1999. Based on the groundwater elevation measurements made on January 18, 1999, the groundwater flow direction at the site is southwesterly, which is consistent with previous sampling events. Figure 4 is a groundwater elevation contour map based on the January 18, 1999 water level measurements.

The soil samples collected during the monitoring well installations were field screened for the potential presence of VOCs using a photoionization detector (PID) and none of the detected readings were above background concentrations. Due to problems with the PID on August 16, 1999, PID readings were not recorded at boring GP-4. The only VOCs detected in the soil samples submitted for laboratory analysis were xylenes and ethylbenzene, and detections of these two compounds are attributed to laboratory contamination as indicated in the analytical reports in Attachment 3. GRO concentrations were below laboratory method detection limits. Soil sample analytical results are presented in Attachment 3 and are summarized in Table 1 and on Figure 2.

Groundwater quality in on-site monitoring wells MW-2R and MW-3R and off-site monitoring wells MW-6, MW-8 and MW-9 exceeded NR 140 standards. The highest concentrations of residual petroleum contaminants were detected at downgradient well MW-6 located in the center of Acewood Boulevard. The extent of contamination to the west was defined by well MW-8 and temporary wells GP-1 and GP-2. Groundwater quality at well MW-8 exceeded the NR 140 enforcement standards (ES) for benzene, methyl tert-butyl ether, trimethylbenzenes, naphthalene and xylenes and the NR 140 preventive action limit (PAL) for ethylbenzene during the January 18, 1999 sampling round; however, only benzene exceeded the NR 140 ES during the August 16, 1999 sampling round. VOC concentrations were low to nondetectable at temporary wells GP-1 and GP-2 and none of the concentrations exceeded NR 140 PALs. No VOCs were detected in temporary wells GP-3 and GP-4 located across Cottage Grove Road north and northwest of the site. Groundwater analytical results are presented in Attachment 4 and are summarized in Tables 2 and 3 and on Figure 3. Groundwater elevation data is summarized in Table 4.

DO concentrations ranged from 0.45 to 1.18 milligrams per liter (mg/l). Low concentrations of DO were detected at wells MW-2, MW-3R, MW-6, MW-8 and MW-9 where elevated concentrations of PVOCs were also detected. Monitoring well MW-7 had the fewest detections of petroleum constituents and the highest DO concentration.

Nitrate and sulfate are utilized as alternate electron acceptors after oxygen has been depleted, and methane is formed by microbial respiration in an anaerobic environment. Nitrate was below the method detection method in all of the groundwater samples except MW-7 where the nitrate concentration was 0.19 mg/l. The sulfate concentration was highest in monitoring well MW-7 which also had the highest DO concentration, indicating this alternate electron acceptor was not consumed. Also, monitoring well MW-7 contained the lowest methane concentration.

The pH of the groundwater measured at the site ranged from 7.14 and 7.64. A pH of 6.0 to 8.5 is generally considered acceptable for biodegradation conditions. The ORP measurements ranged from 91 to 226 millivolts (mV), with an average of 166 mV. An ORP greater than 50 mV generally indicated aerobic (oxidizing) conditions.

The specific conductance measurements ranged from 771 micrograms per centimeter (µg/cm) to 1,316 µg/cm. Resistivity measurements ranged from 0.759 kilo ohms per centimeter (k ohms/cm) to 1.298 k ohms/cm.

Supplemental Site Investigation Conclusions

The soil sample analytical results indicate that the extent of soil contamination has been defined and there appears to be no off-site unsaturated soil impacts. The extent of groundwater contamination has been defined and the groundwater

plume extends off-site to the west to well MW-8. Based on groundwater analytical results from temporary well GP-1, located 45 feet west of well MW-8, groundwater contamination above NR 140 standards appears to be restricted to the right of way of Acewood Boulevard.

KEY will prepare a *Remedial Action Plan Addenda* in accordance with NR 722, COMM 46 and COMM 47.

Please call if you have any questions.

Sincerely,

KEY ENGINEERING GROUP, LTD.

Larry J. Wehrheim, P.G., CHMM
Senior Project Manager

Gregory L. Johnson, CHMM, P.G., P.E.
Manager of Technical Services

LJW/mas

Enclosures:
- Table 1: Summary of Soil Sample Analytical Results
- Table 2: Summary of Groundwater Sample Analytical Data
- Table 3: Summary of Natural Attenuation Indicator Parameter Data
- Table 4: Summary of Groundwater Elevation Data
- Figure 1: Site Layout With Monitoring Well Locations
- Figure 2: Summary of Soil Sample Analytical Results
- Figure 3: Summary of Groundwater Sample Analytical Results
- Figure 4: Groundwater Elevation Contour Map
- Attachment 1: Soil Boring Logs
  PID Calibration Forms
  Borehole Abandonment Forms
- Attachment 2: Monitoring Well Construction Forms and Monitoring Well Development Forms
- Attachment 3: Soil Sample Laboratory Analytical Results
- Attachment 4: Groundwater Sample Laboratory Analytical Results

cc: Mr. Ed Francois
PECFA File

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TABLE 1

SUMMARY OF SOIL SAMPLE ANALYTICAL RESULTS

SUPPLEMENTAL SITE INVESTIGATION

COTTAGE GROVE QUICK-MART
4601 Cottage Grove Road
Madison, Wisconsin

PARAMETER	SAMPLE IDENTIFICATION																		GRCL
	B-1		B-2		B-3		B-4N	B-4		B-5		B-6		B-7		B-8			
Date Collected	2/16/96	2/16/96	2/16/96	2/16/96	2/16/96	2/16/96	7/29/96	2/16/96	2/16/96	2/15/96	2/15/96	2/15/96	2/15/96	2/15/96	2/15/96	2/15/96	2/15/96		
Sample Depth (feet bgs)	13.5-15	16-17.5	3.5-5	16-17.5	11-12.5	16-17.5	8.5-10	13.5-15	16-17.5	13.5-15	16-17.5	13.5-15	16-17.5	13.5-15	16-17.5	13.5-15	16-17.5		
PID (i.u.)	<1	<1	27	<1	<1	<1	NA	1,142	182	680	147	40	78	<1	<1	<2	<1		
Lead (mg/kg)	NA	<4.0	NA	<4.0	NA	<4.0	2.9	5.2	NA	5.2	NA	NA	<4.0	<4.0	NA	<4.0	NA		50
GRO (mg/kg)	<5.0	<5.0	6.1	<5.0	<5.0	<5.0	6.4	**170**	17	**350**	19	10	39	<5.0	<5.0	<5.0	<5.0		100
DRO (mg/kg)	<5.0	<5.0	NA	NA	<5.0	<5.0	<5.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		100
Detected VOCs (ug/kg)																			
Benzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<25	<100	<5.0	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0		5.5
Ethylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	61	310	81	510	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0		2,900
Isopropylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<3.5	140	21	130	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0		NE
Methylene Chloride*	58	<50.0	<50.0	<50.0	67	58	<34	<1,000	<50.0	150	64	59	<50.0	<50.0	<50.0	<50.0	<50.0		NE
Naphthalene	<5.0	<5.0	27	<5.0	<5.0	<5.0	140	800	71	150	5.9	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0		400 [1]
n-Butylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	270	<100	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0		NE
n-Propylbenzene	<5.0	<5.0	6	<5.0	<5.0	<5.0	74	630	76	560	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0		NE
p-Isopropyltoluene	<5.0	<5.0	15	<5.0	<5.0	<5.0	<9.8	450	34	400	5.7	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0		NE
sec-Butylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<6.0	230	20	270	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0		NE
Toluene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<3.4	<100	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0		1,500
Total Xylenes	<15.0	<15.0	100	<15.0	<15.0	<15.0	220	1,700	340	110	<15.0	<15.0	<15.0	<15.0	<15.0	<15.0	<15.0		4,100
TMBs	<10.0	<10.0	220	<10.0	<10.0	<10.0	610	4,800	490	3,430	24.4	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0		NE

Notes:
* - Methylene Chloride was listed by the laboratory as a common laboratory contaminant.
[1] - Wisconsin Department of Natural Resources Interim Guidance
B - ethylbenzene and xylene were present in the laboratory method blank at concentrations of 35 ug/kg and 150 ug/kg, respectively
bgs - below ground surface
Bold values exceed GRCL
DRO - diesel range organics
GRCL - generic residual contaminant level based on protection of groundwater
GRO - gasoline range organics
i.u. - instrument units
mg/kg - milligrams per kilogram
NA - not analyzed
NE - RCL not established
PID - photoionization detector
TMBs - Trimethylbenzenes
ug/kg - micrograms per kilogram
VOCs - volatile organic compounds

TABLE 1 (CONTINUED)

SUMMARY OF SOIL SAMPLE ANALYTICAL RESULTS

SUPPLEMENTAL SITE INVESTIGATION

COTTAGE GROVE QUICK-MART
4601 Cottage Grove Road
Madison, Wisconsin

PARAMETER	SAMPLE IDENTIFICATION																	GRCL
	B-9N	B-9		B-10		B-11		B-12		B-13		B-14		B-15		B-16		
Date Collected	7/29/96	2/15/96	2/15/96	7/29/96	7/29/96	7/29/96	7/29/96	7/29/96	7/29/96	7/29/96	7/29/96	12/8/98	12/8/98	12/8/98	12/8/98	12/8/98	12/8/98	
Sample Depth (feet bgs)	6-7.5	13.5-15	16-17.5	8.5-10	13.5-15	6-7.5	13.5-15	3.5-5	13.5-15	3.5-5	13.5-15	3.5-5	8.5-10	3.5-5	8.5-10	3.5-5	8.5-10	
PID (i.u.)	NA	>2,000	1,209	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Lead (mg/kg)	3.2	5.1	NA	12	8.1	9.4	1.9	5.4	5.5	11	3.2	NA	NA	NA	NA	NA	NA	50
GRO (mg/kg)	6.2	**210**	**450**	<5.3	<5.4	<5.2	<6.0	<5.5	<5.6	<6.6	<5.6	<6.4	<5.2	<6.0	<6.1	<5.8	<5.3	100
DRO (mg/kg)	<5.6	**140**	47	<5.3	<5.4	<5.2	<6.0	<5.5	<5.6	<6.6	<5.6	NA	NA	NA	NA	NA	NA	100
Detected VOCs (ug/kg)																		
Benzene	---	<100	<5.0	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	5.5
Ethylbenzene	100	1,700	600	<3.5	<3.5	<3.5	76	<3.5	<3.5	<3.5	<3.5	56B	55B	48B	32B	<25	27B	2,900
Isopropylbenzene	<3.5	460	110	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<25	<25	<25	<25	<25	<25	NE
Methylene Chloride*	<34	<1,000	150	<34	<34	<34	<34	<34	<34	<34	<34	<100	<100	<100	<100	<100	<100	NE
Naphthalene	40	1,200	450	<7.4	<7.4	<7.4	65	<7.4	<7.4	<7.4	<7.4	<25	<25	<25	<25	<25	<25	400 [1]
n-Butylbenzene	170	<100	<5.0	<9.6	<9.6	<9.6	61	<9.6	<9.6	<9.6	<9.6	<25	<25	<25	<25	<25	<25	NE
n-Propylbenzene	67	1,800	400	<8.4	<8.4	<8.4	39	<8.4	<8.4	<8.4	<8.4	<25	<25	<25	<25	<25	<25	NE
p-Isopropyltoluene	<9.8	670	130	<9.8	<9.8	<9.8	<9.8	<9.8	<9.8	<9.8	<9.8	<25	<25	<25	<25	<25	<25	NE
sec-Butylbenzene	<6.0	310	62	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<25	<25	<25	<25	<25	<25	NE
Toluene	<3.4	320	86	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	<25	<25	<25	<25	<25	<25	NE
Total Xylenes	490	**6,800**	2,700	<6.6	<6.6	<6.6	230	<6.6	<6.6	<6.6	<6.6	260B	240B	200B	150B	100B	130B	1,500
TMBs	700	13,300	2,890	<11.2	<11.2	<11.2	226	<11.2	<11.2	<11.2	<11.2	<50	<50	<50	<50	<50	<50	4,100
																		NE

Notes:
* - Methylene Chloride was listed by the laboratory as a common laboratory contaminant.
[1] - Wisconsin Department of Natural Resources Interim Guidance
B - ethylbenzene and xylene were present in the laboratory method blank at concentrations of 35 ug/kg and 150 ug/kg, respectively
bgs - below ground surface
Bold values exceed GRCL
DRO - diesel range organics
GRCL - generic residual contaminant level based on protection of groundwater
GRO - gasoline range organics
i.u. - instrument units
mg/kg - milligrams per kilogram
NA - not analyzed
NE - RCL not established
PID - photoionization detector
TMBs - Trimethylbenzenes
ug/kg - micrograms per kilogram
VOCs - volatile organic compounds

TABLE 2

SUMMARY OF GROUNDWATER SAMPLE ANALYTICAL DATA

SUPPLEMENTAL SITE INVESTIGATION

COTTAGE GROVE CITGO QUICK MART
4601 Cottage Grove Road
Madison, Wisconsin

WELL I.D. AND SAMPLING DATE	GRO (ug/l)	DRO (ug/l)	BENZENE (ug/l)	ETHYLBENZENE (ug/l)	TOLUENE (ug/l)	XYLENES (ug/l)	MTBE (ug/l)	TMBs (ug/l)	sec-BB (ug/l)	IPB (ug/l)	n-PB (ug/l)	n-BB (ug/l)	P-IPT (ug/l)	NAPHTHALENE (ug/l)
PAL (ug/l)	NES	NES	0.5	140	68.6	124	12	96	NES	NES	NES	NES	NES	8
ES (ug/l)	NES	NES	5	700	343	620	60	480	NES	NES	NES	NES	NES	40
MW-1 (a)														
2/22/96	<5.0	<0.10	<0.50	<1.0	<1.0	<3.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
8/12/96	<50	---	<0.50	<0.50	<0.50	<0.50	<5.0	<2.0	---	---	---	---	---	---
MW-2 (a)														
2/22/96	3,900	3.2	**21**	82	21	160	49	**630**	<10	40	110	290	15	**66**
8/12/96	11,000	3.2	**28**	150	42	280	<250	**910**	<10	---	---	---	---	---
MW-2R														
10/28/97	2,100	---	**41**	52	8.9	52	**81**	72.4	---	---	---	---	---	---
3/5/98	1,800	---	27	53	10	68	110	137	---	---	---	---	---	---
6/8/98	3,000	---	23	110	**490**	280	150	135.9 Q	---	---	---	---	---	---
1/18/99	1,300	---	33	22	11	26	500	39	---	---	---	---	---	---
8/16/99	---	---	5.2	<0.50	5.6	25	2,000	4.7	---	---	---	---	---	---
8/16/99 (DUP)	---	---	4.7	23	4.7	18	2,100	27.1	---	---	---	---	---	2.9
MW-3 (a)														2.9
2/22/96	27,000	11	**180**	**2,200**	**2,300**	**8,700**	530	**3,170**	<50	110	360	400	<50	**820**
8/12/96	41,000	8.8	**1,500**	**1,700**	**1,500**	**10,000**	**1,400**	**4,140**	<50	---	---	---	---	---
MW-3R														
10/28/97	26,000	---	**830**	**1,400**	**2,800**	**6,900**	**59**	**2,550**	---	---	---	---	---	---
3/5/98	25,000	---	**280**	**1,600**	**700**	**7,700**	**24**	**3,320**	---	---	---	---	---	---
6/8/98	14,000	---	**230**	200	**130**	**3,700**	**29**	**2,070**	---	---	---	---	---	---
1/18/99	8,000	---	**75**	240	**140**	**860**	**15**	**434**	---	---	---	---	---	---
8/16/99	---	---	**23**	160	58	**610**	2.5	461	---	---	---	---	---	**74**

Notes:
--- - not analyzed
< - less than
(a) - abandoned
DRO - diesel range organics
ES - NR 140 Enforcement Standard
GRO - gasoline range organics
IPB - isopropylbenzene
MTBE - methyl tert-butyl ether
n-BB - n-butylbenzene
NES - No established NR 140 standard
n-PB - n-propylbenzene
PAL - NR 140 Preventive Action Limit
p-IPT - p-isopropyltoluene
Q - concentration between the limit of detection and the limit of quantitation
sec-BB - sec-butylbenzene
TMBs - trimethylbenzenes
ug/l - micrograms per liter
Values in bold exceed the NR 140 PAL
Values shaded and bold exceed the NR 140 ES

TABLE 2 (CONTINUED)

SUMMARY OF GROUNDWATER SAMPLE ANALYTICAL DATA

SUPPLEMENTAL SITE INVESTIGATION

COTTAGE GROVE CITGO QUICK MART
4601 Cottage Grove Road
Madison, Wisconsin

WELL I.D. AND SAMPLING DATE	GRO (ug/l)	DRO (ug/l)	BENZENE (ug/l)	ETHYLBENZENE (ug/l)	TOLUENE (ug/l)	XYLENES (ug/l)	MTBE (ug/l)	TMBs (ug/l)	sec-BB (ug/l)	IPB (ug/l)	n-PB (ug/l)	n-BB (ug/l)	P-IPT (ug/l)	NAPHTHALENE (ug/l)
PAL (ug/l)	NES	NES	0.5	140	68.6	124	12	96	NES	NES	NES	NES	NES	8
ES (ug/l)	NES	NES	5	700	343	620	60	480	NES	NES	NES	NES	NES	40
MW-4 (a)														
2/22/96	<50	<0.10	<0.50	<1.0	<1.0	<3.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
8/12/96	<50	---	<0.50	<0.50	<0.50	<0.50	<5.0	<2.0	---	---	---	---	---	---
MW-5 (a)														
8/12/96	<50	<0.10	<5.0	<5.0	<5.0	<5.0	340	<20	<5.0	<5.0	<5.0	<5.0	<5.0	<8.0
MW-6														
8/12/96	7,000	1.6	33	320	<10	710	<100	712	15	36	110	82	<10	170
10/28/97	7,300	---	150	420	36	788	220	1,030	---	---	---	---	---	---
3/5/98	5,700	---	150	340	12	424	150	722	---	---	---	---	---	---
6/8/98	6,200	---	200	450	49	800	330	979	---	---	---	---	---	---
1/18/99	5,500	---	84	290	13	550	190	940	---	---	---	---	---	---
8/16/99	---	---	190	650	87	330	77	1,630	---	---	---	---	---	---
MW-7														
1/18/99	68	---	<0.50	<0.50	<0.50	<0.50	1.1	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<2.0
8/16/99	---	---	<0.50	<0.50	<0.50	<0.50	0.28	<2.0	---	---	---	---	---	<2.0
MW-8														
1/18/99	11,000	---	600	540	63	1,100	82	834	7.6	50	140	<5.0	<5.0	190
8/16/99	---	---	20	140	<2.5	7.0	8.4	300	---	---	---	---	---	<10
MW-9														
1/18/99	2,000	---	37	<25	<25	<25	1500	<100	<25	<25	<25	<25	<25	<100
8/16/99	---	---	12	<0.50	0.96	0.89	690	5.9	---	---	---	---	---	<2.0

Notes:
--- - not analyzed
< - less than
(a) - abandoned
DRO - diesel range organics
ES - NR 140 Enforcement Standard
GRO - gasoline range organics
IPB - isopropylbenzene
MTBE - methyl tert-butyl ether
n-BB - n-butylbenzene
NES - No established NR 140 standard
n-PB - n-propylbenzene
PAL - NR 140 Preventive Action Limit
p-IPT - p-isopropyltoluene
Q - concentration between the limit of detection and the limit of quantitation
sec-BB - sec-butylbenzene
TMBs - trimethylbenzenes
ug/l - micrograms per liter
Values in bold exceed the NR 140 PAL
Values shaded and bold exceed the NR 140 ES

TABLE 3

SUMMARY OF NATURAL ATTENUATION INDICATOR PARAMETER DATA

SUPPLEMENTAL SITE INVESTIGATION

COTTAGE GROVE CITGO QUICK MART
4601 Cottage Grove Road
Madison, Wisconsin

WELL IDENTIFICATION AND SAMPLING DATE	TEMP. (°F)	DISSOLVED O_2 (mg/l)	SP COND. (uS/cm)	RESISTIVITY (k ohms/cm)	pH (s.u.)	ORP (mV)	NITRATE (mg/l)	SULFATE (mg/l)	METHANE (ug/l)
MW-2R									
3/5/98	53.9	0.88	1,147	0.871	6.95	186	---	---	---
6/8/98	52.0	0.64	1,302	0.768	7.50	336	---	---	---
1/18/99	55.1	0.67	771	1.298	7.48	158	<0.050	<10	180
MW-3R									
3/5/98	56.6	3.31	1,610	0.621	6.81	255	---	---	---
6/8/98	55.4	1.71	1,579	0.635	7.20	367	---	---	---
1/18/99	56.4	1.03	1,018	0.983	7.14	197	<0.050	21	40
MW-6									
3/5/98	53.1	2.79	1,263	0.79	7.00	151	---	---	---
6/8/98	54.5	0.69	1,959	0.511	7.30	232	---	---	---
1/18/99	54.9	0.91	955	1.048	7.24	91	<0.050	<10	230
MW-7									
1/18/99	54.2	1.18	959	1.043	7.64	204	0.19	41	<7.1
MW-8									
1/18/99	55.0	0.45	1,316	0.759	7.33	121	<0.050	<10	1,300
MW-9									
1/18/99	52.4	0.47	976	1.025	7.18	226	<0.050	22	640

Notes:
--- - not analyzed
°F - Degrees Fahrenheit
kohms/cm - kilo ohms per centimeter
mg/l - milligrams per liter
mV - millivolts
O_2 - oxygen
ORP - oxidation/reduction potential
s.u. - standard units
Sp Cond. - specific conductance
ug/l - micrograms per liter
uS/cm - microsiemens per centimeter

TABLE 4

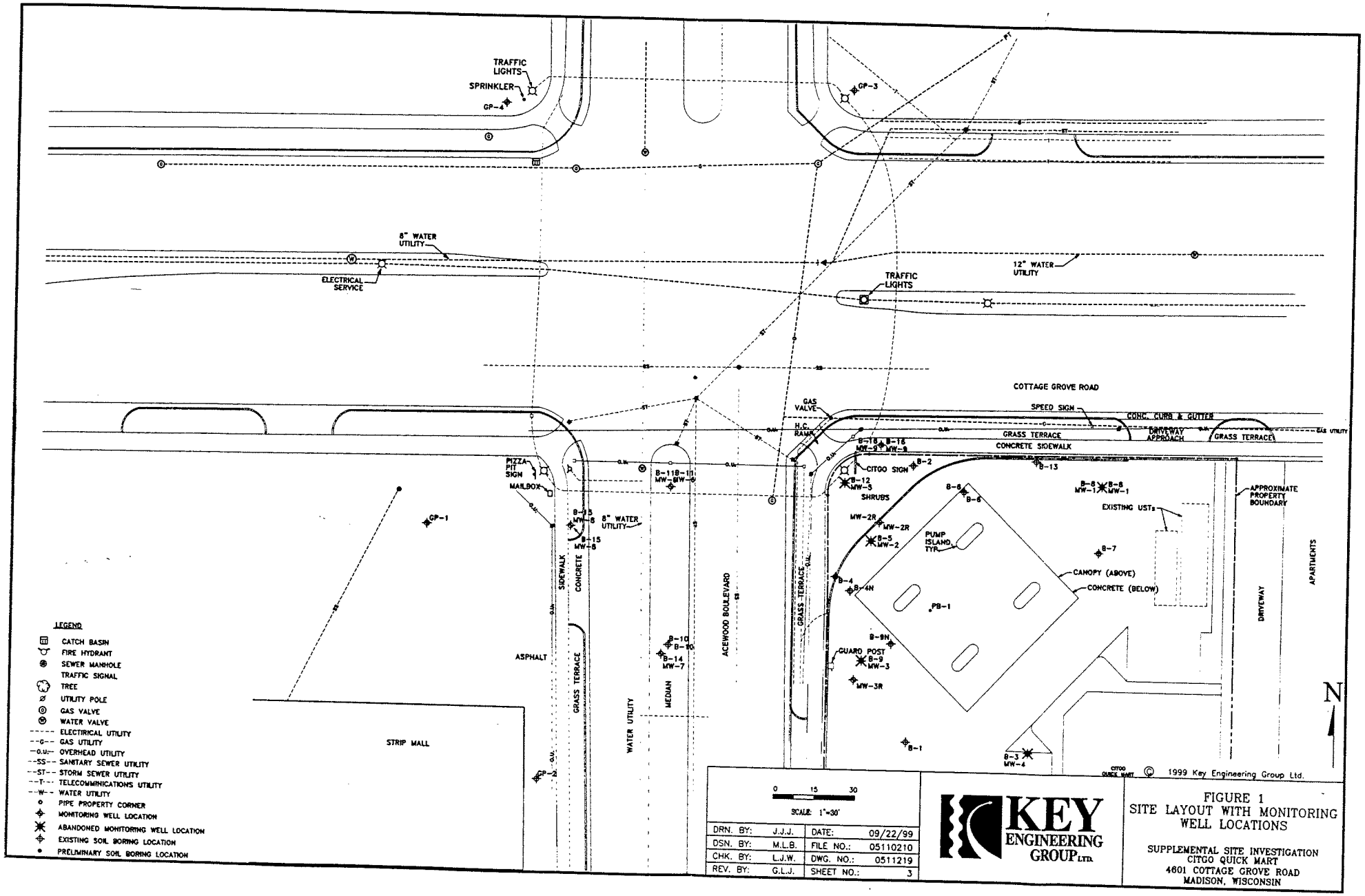
SUMMARY OF GROUNDWATER ELEVATION DATA

SUPPLEMENTAL SITE INVESTIGATION

COTTAGE GROVE CITGO QUICK MART
4601 Cottage Grove Road
Madison, Wisconsin

WELL NO.	TOP OF PVC ELEVATION (feet)	DATE	DEPTH TO GROUNDWATER (feet)	GROUNDWATER ELEVATION (feet)
MW-2R	99.97	10/28/97	12.25	87.72
		3/5/98	17.71	82.26
		6/8/98	11.21	88.76
		1/18/99	12.34	87.63
		8/16/99	11.26	88.71
MW-3R	100.59	10/28/97	12.99	87.60
		3/5/98	18.76	81.83
		6/8/98	12.00	88.59
		1/18/99	13.31	87.28
		8/16/99	11.98	88.61
MW-6	99.31	10/28/97	11.90	87.41
		3/5/98	17.25	82.06
		6/8/98	11.13	88.18
		1/18/99	11.95	87.36
		8/16/99	11.04	88.27
MW-7	99.91	1/18/99	12.59	87.32
		8/16/99	11.61	88.30
MW-8	99.67	1/18/99	12.42	87.25
		8/16/99	11.53	88.14
MW-9	100.04	1/18/99	12.32	87.72
		8/16/99	11.25	88.79

Notes:
Bench Mark - north flange of fire hydrant on west side of Acewood Boulevard, west of site, which was assumed to have an elevation of 100 feet
PVC - polyvinyl chloride used for well casing


TRAFFIC LIGHTS
SPRINKLER
GP-4
GP-3
8" WATER UTILITY
ELECTRICAL SERVICE
12" WATER UTILITY
TRAFFIC LIGHTS
COTTAGE GROVE ROAD
SPEED SIGN
CONC. CURB & GUTTER
GAS VALVE
H.C. RAMP
GRASS TERRACE
DRIVEWAY APPROACH
GRASS TERRACE
GAS UTILITY
CONCRETE SIDEWALK
B-18 MW-9
B-16 MW-8
PIZZA PIT SIGN
MAILBOX
B-11 MW-6
B-2
CITGO SIGN
B-12 MW-5
B-13
SHRUBS
B-8 MW-1
B-8 MW-1
APPROXIMATE PROPERTY BOUNDARY
EXISTING USTs
B-6
B-6
MW-2R
MW-2R
PUMP ISLAND TYP.
B-5 MW-2
B-7
GP-1
B-15 MW-8
8" WATER UTILITY
SIDEWALK
CONCRETE
ACEWOOD BOULEVARD
GRASS TERRACE
CANOPY (ABOVE)
CONCRETE (BELOW)
B-4
B-4N
PB-1
APARTMENTS
DRIVEWAY
B-9N
GUARD POST
B-9 MW-3
MW-3R
B-10
B-14 MW-7
ASPHALT
MEDIAN
WATER UTILITY
STRIP MALL
GP-2
B-1
B-3 MW-4
N
CITGO QUICK MART
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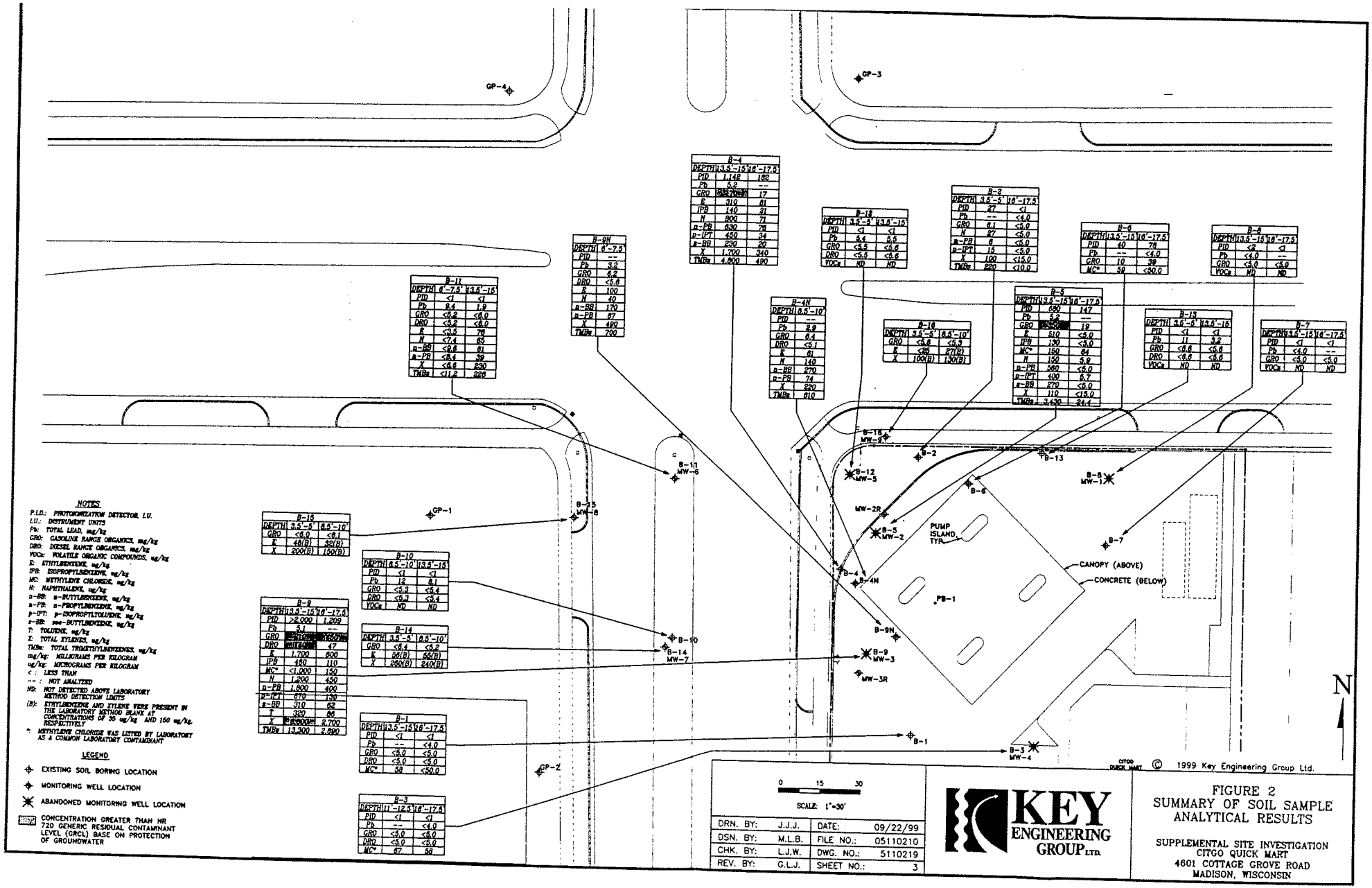
LEGEND
CATCH BASIN
FIRE HYDRANT
SEWER MANHOLE
TRAFFIC SIGNAL
TREE
UTILITY POLE
GAS VALVE
WATER VALVE
ELECTRICAL UTILITY
GAS UTILITY
OVERHEAD UTILITY
SANITARY SEWER UTILITY
STORM SEWER UTILITY
TELECOMMUNICATIONS UTILITY
WATER UTILITY
PIPE PROPERTY CORNER
MONITORING WELL LOCATION
ABANDONED MONITORING WELL LOCATION
EXISTING SOIL BORING LOCATION
PRELIMINARY SOIL BORING LOCATION
0 15 30
SCALE: 1"=30'
DRN. BY: J.J.J.
DATE: 09/22/99
DSN. BY: M.L.B.
FILE NO.: 05110210
CHK. BY: L.J.W.
DWG. NO.: 0511219
REV. BY: G.L.J.
SHEET NO.: 3
KEY ENGINEERING GROUP LTD.
FIGURE 1
SITE LAYOUT WITH MONITORING WELL LOCATIONS
SUPPLEMENTAL SITE INVESTIGATION
CITGO QUICK MART
4601 COTTAGE GROVE ROAD
MADISON, WISCONSIN



NOTES

P.I.D.: PHOTOIONIZATION DETECTOR, I.U.
I.U.: INSTRUMENT UNITS
Pb: TOTAL LEAD, mg/kg
GRO: GASOLINE RANGE ORGANICS, mg/kg
DRO: DIESEL RANGE ORGANICS, mg/kg
VOCs: VOLATILE ORGANIC COMPOUNDS, ug/kg
B: ETHYLBENZENE, ug/kg
IPB: ISOPROPYLBENZENE, ug/kg
MC: METHYLENE CHLORIDE, ug/kg
N: NAPHTHALENE, ug/kg
n-BB: n-BUTYLBENZENE, ug/kg
n-PB: n-PROPYLBENZENE, ug/kg
p-IPT: p-ISOPROPYLTOLUENE, ug/kg
s-BB: sec-BUTYLBENZENE, ug/kg
T: TOLUENE, ug/kg
X: TOTAL XYLENES, ug/kg
TMBs: TOTAL TRIMETHYLBENZENES, ug/kg
mg/kg: MILLIGRAMS PER KILOGRAM
ug/kg: MICROGRAMS PER KILOGRAM
< : LESS THAN
-- : NOT ANALYZED
ND: NOT DETECTED ABOVE LABORATORY METHOD DETECTION LIMITS
(B): ETHYLBENZENE AND XYLENE WERE PRESENT IN THE LABORATORY METHOD BLANK AT CONCENTRATIONS OF 35 ug/kg AND 150 ug/kg, RESPECTIVELY
*: METHYLENE CHLORIDE WAS LISTED BY LABORATORY AS A COMMON LABORATORY CONTAMINANT

LEGEND

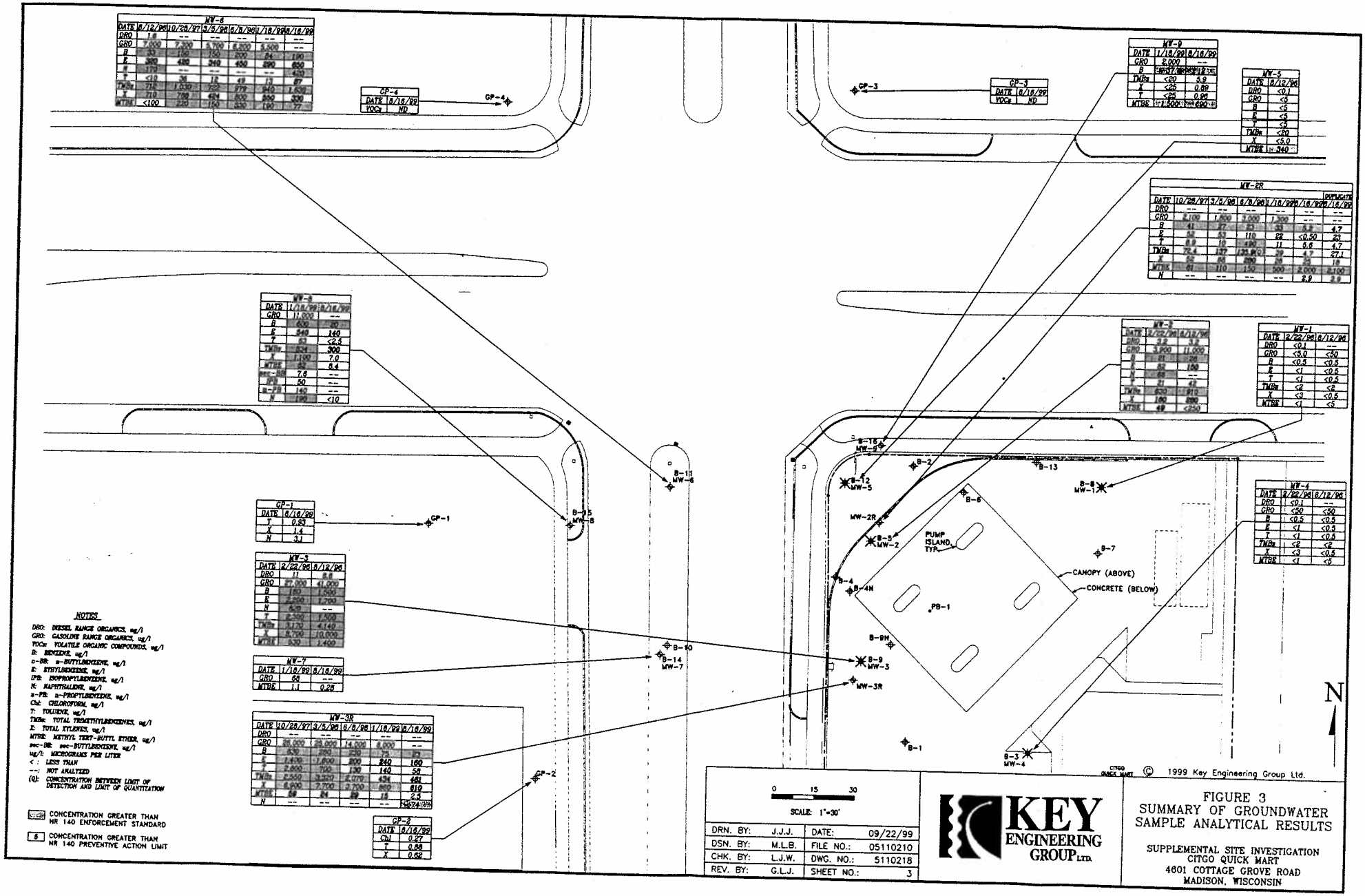
- EXISTING SOIL BORING LOCATION
- MONITORING WELL LOCATION
- ABANDONED MONITORING WELL LOCATION
- CONCENTRATION GREATER THAN NR 720 GENERIC RESIDUAL CONTAMINANT LEVEL (GRCL) BASE ON PROTECTION OF GROUNDWATER

DRN. BY:	J.J.J.	DATE:	09/22/99
DSN. BY:	M.L.B.	FILE NO.:	05110210
CHK. BY:	L.J.W.	DWG. NO.:	5110219
REV. BY:	G.L.J.	SHEET NO.:	3

KEY ENGINEERING GROUP LTD.

FIGURE 2
SUMMARY OF SOIL SAMPLE ANALYTICAL RESULTS

SUPPLEMENTAL SITE INVESTIGATION
CITGO QUICK MART
4601 COTTAGE GROVE ROAD
MADISON, WISCONSIN

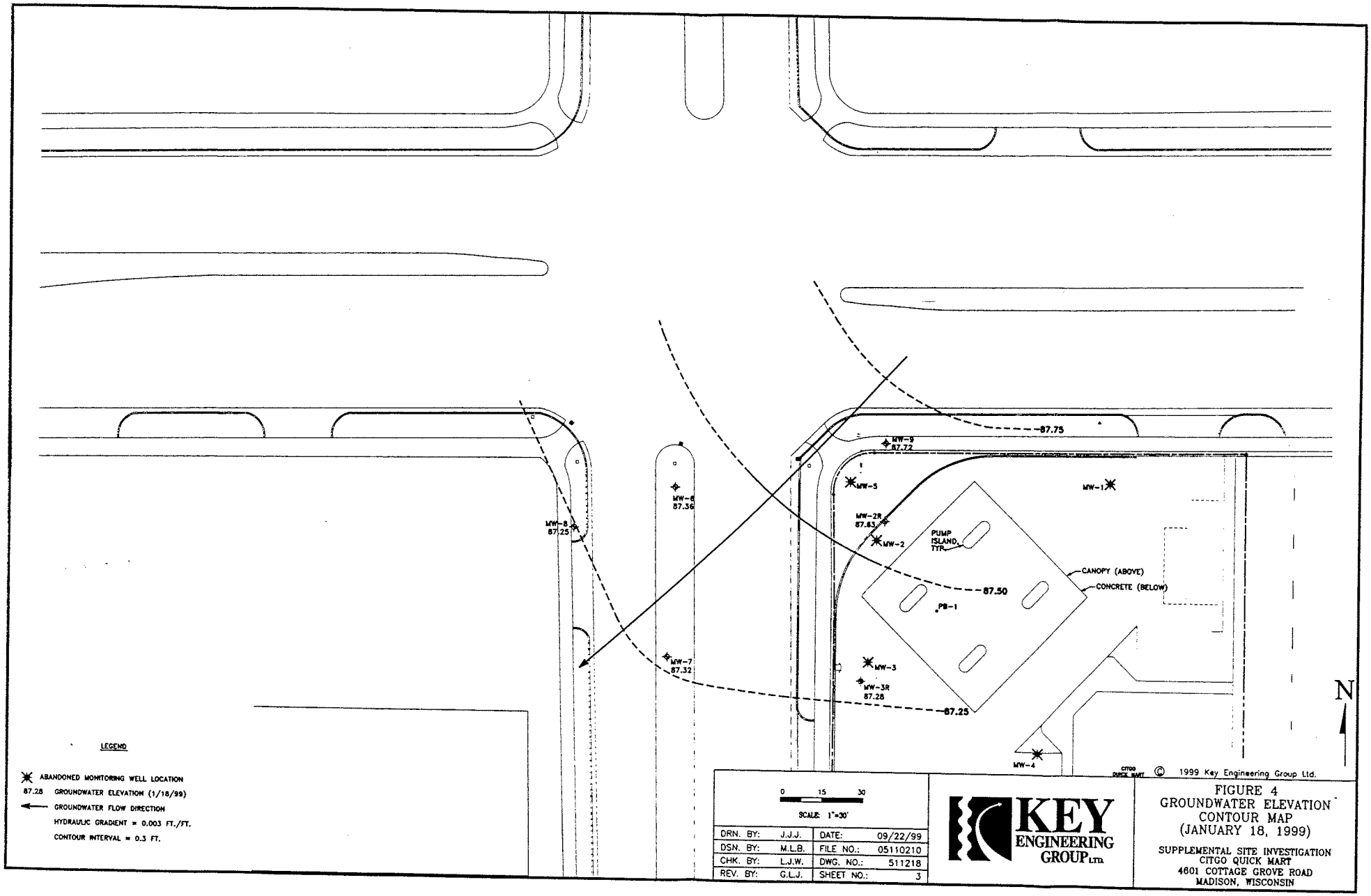


DRN. BY:	J.J.J.	DATE:	09/22/99
DSN. BY:	M.L.B.	FILE NO.:	05110210
CHK. BY:	L.J.W.	DWG. NO.:	5110218
REV. BY:	G.L.J.	SHEET NO.:	3

KEY ENGINEERING GROUP LTD.

FIGURE 3
SUMMARY OF GROUNDWATER SAMPLE ANALYTICAL RESULTS

SUPPLEMENTAL SITE INVESTIGATION
CITGO QUICK MART
4601 COTTAGE GROVE ROAD
MADISON, WISCONSIN



LEGEND

- ABANDONED MONITORING WELL LOCATION
- 87.28 GROUNDWATER ELEVATION (1/18/99)
- GROUNDWATER FLOW DIRECTION
- HYDRAULIC GRADIENT = 0.003 FT./FT.
- CONTOUR INTERVAL = 0.3 FT.

0 15 30

SCALE: 1"=30'

DRN. BY:	J.J.J.	DATE:	09/22/99
DSN. BY:	M.L.B.	FILE NO.:	05110210
CHK. BY:	L.J.W.	DWG. NO.:	511218
REV. BY:	G.L.J.	SHEET NO.:	3

KEY ENGINEERING GROUP Ltd.

FIGURE 4
GROUNDWATER ELEVATION CONTOUR MAP
(JANUARY 18, 1999)

SUPPLEMENTAL SITE INVESTIGATION
CITGO QUICK MART
4601 COTTAGE GROVE ROAD
MADISON, WISCONSIN

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Cottage Grove Citgo Quick Mart

Facility License, Permit or Monitoring Number:

Type of Well: Water Table Observation Well ☒ 11; Piezometer ☐ 12

Distance Well Is From Waste/Source Boundary: _____ ft.

Is Well A Point of Enforcement Std. Application? ☒ Yes ☐ No

Local Grid Location of Well: _____ ft. ☐ N. ☐ S. _____ ft. ☐ E. ☐ W.

Grid Origin Location: Lat. ° ' " Long. ° ' " or

St. Plane _____ ft. N, _____ ft. E.

Section Location of Waste/Source: NW 1/4 of NW 1/4 of Sec. 10 T. 7 N, R. 10 ☒ E. ☐ W.

Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☒ Downgradient n ☐ Not Known

Well Name: MW-7

Wis. Unique Well Number / DNR Well Number:

Date Well Installed: 12/8/98

Well Installed By: (Person's Name and Firm)
Dave Kleber
Key Engineering Group

A. Protective pipe, top elevation _____ ft. MSL

B. Well casing, top elevation _____ ft. MSL

C. Land surface elevation _____ ft. MSL

D. Surface seal, bottom _____ ft. MSL or 1.0 ft.

12. USC classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☒ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; _____ Other ☐

15. Drilling fluid used: Water ☐ 02 Air ☐ 01; Drilling Mud ☐ 03 None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe N/A

17. Source of water (attach analysis):
N/A

E. Bentonite seal, top _____ ft. MSL or 1.0 ft.

F. Fine sand, top _____ ft. MSL or 5.5 ft.

G. Filter pack, top _____ ft. MSL or 6.5 ft.

H. Screen joint, top _____ ft. MSL or 7.5 ft.

I. Well bottom _____ ft. MSL or 17.5 ft.

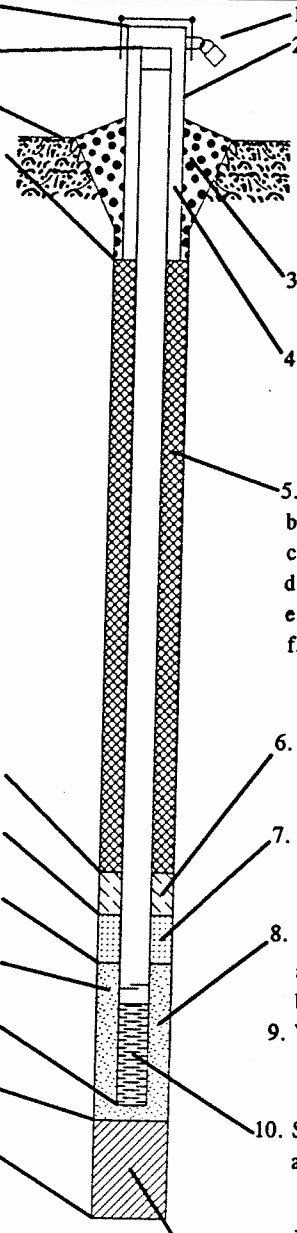
J. Filter pack, bottom _____ ft. MSL or 18.0 ft.

K. Borehole, bottom _____ ft. MSL or 18.0 ft.

L. Borehole, diameter 8.25 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 10.0 in.
b. Length: 1.0 ft.
c. Material: _____ Steel ☒ 04; Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: _____

3. Surface seal: Bentonite ☐ 30; Concrete ☒ 01; _____ Other ☐

4. Material between well casing and protective pipe:
Bentonite ☐ 30; Annular space seal ☐; Sand Other ☒

5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight . . Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight . . . Bentonite slurry ☐ 31
d. _____ % Bentonite . . . Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☐ 08

6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite pellets ☐ 32
c. CETCO PureGold Other ☒

7. Fine sand material: Manufacturer, product name and mesh size
a. Red Flint #45-55, 1-50 lb bag
b. Volume added 0.5 ft^3

8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint #30, 5.5-50 lb bags
b. Volume added 2.75 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; _____ Other ☐

10. Screen material: PVC
a. Screen Type: Factory cut ☒ 11; Continuous slot ☐ 01; _____ Other ☐
b. Manufacturer Diedrich
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.

11. Backfill material (below filter pack): _____ None ☒ 14; Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Dave Kleber

Firm: KEY ENGINEERING GROUP, LTD.
W66 N215 Commerce Court Cedarburg, WI 53012
Tel: (414) 375-4750
Fax: (414) 375-9680

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141,Wis. Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Cottage Grove Citgo Quick Mart

Facility License, Permit or Monitoring Number:

Type of Well: Water Table Observation Well ☒ 11; Piezometer ☐ 12

Distance Well Is From Waste/Source Boundary: ft.

Is Well A Point of Enforcement Std. Application? ☒ Yes ☐ No

Local Grid Location of Well: ☐ N. _____ ft. ☐ S. _____ ft. ☐ E. ☐ W.

Grid Origin Location: Lat. ° ' " Long. ° ' " or

St. Plane _____ ft. N, _____ ft. E.

Section Location of Waste/Source: NW 1/4 of NW 1/4 of Sec. 10 T. 7 N, R. 10 ☒ E. ☐ W.

Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☒ Downgradient n ☐ Not Known

Well Name: MW-8

Wis. Unique Well Number / DNR Well Number:

Date Well Installed: 12/8/98

Well Installed By: (Person's Name and Firm)
Dave Kleber
Key Engineering Group

A. Protective pipe, top elevation _____ ft. MSL

B. Well casing, top elevation _____ ft. MSL

C. Land surface elevation _____ ft. MSL

D. Surface seal, bottom _____ ft. MSL or 1.0 ft.

12. USC classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☒ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; _____ Other ☐

15. Drilling fluid used: Water ☐ 02 Air ☐ 01; Drilling Mud ☐ 03 None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe N/A

17. Source of water (attach analysis):
N/A

E. Bentonite seal, top _____ ft. MSL or 1.0 ft.

F. Fine sand, top _____ ft. MSL or 5.5 ft.

G. Filter pack, top _____ ft. MSL or 6.5 ft.

H. Screen joint, top _____ ft. MSL or 7.5 ft.

I. Well bottom _____ ft. MSL or 17.5 ft.

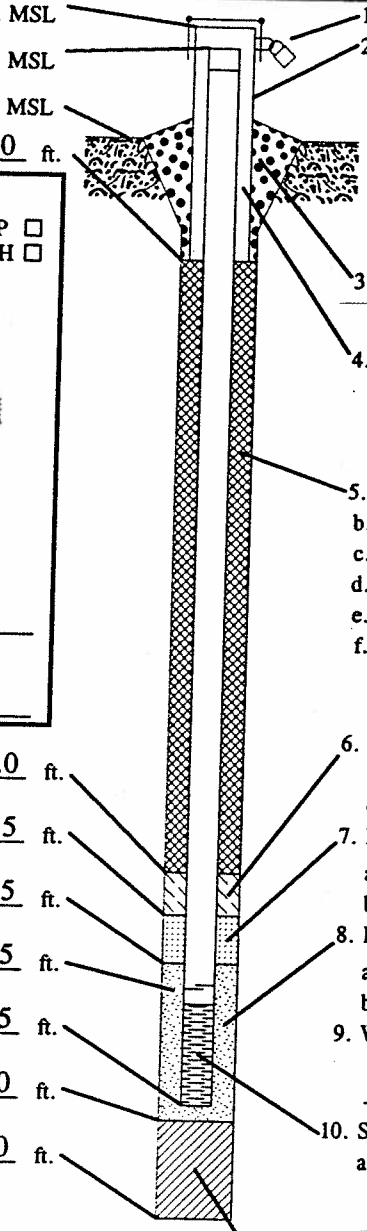
J. Filter pack, bottom _____ ft. MSL or 18.0 ft.

K. Borehole, bottom _____ ft. MSL or 18.0 ft.

L. Borehole, diameter 8.25 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 10.0 in.
b. Length: 1.0 ft.
c. Material: _____ Steel ☒ 04 Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: _____

3. Surface seal: Bentonite ☐ 30 Concrete ☒ 01 _____ Other ☐

4. Material between well casing and protective pipe:
Bentonite ☐ 30 Annular space seal ☐ Sand Other ☒

5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight . . Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight . . . Bentonite slurry ☐ 31
d. _____ % Bentonite . . . Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01 Tremie pumped ☐ 02 Gravity ☐ 08

6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite pellets ☐ 32
c. CETCO PureGold Other ☒

7. Fine sand material: Manufacturer, product name and mesh size
a. Red Flint #45-55, 1-50 lb bag
b. Volume added 0.5 ft^3

8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint #30, 5-50 lb bags
b. Volume added 2.5 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ 23
Flush threaded PVC schedule 80 ☐ 24
_____ Other ☐

10. Screen material: PVC
a. Screen Type: Factory cut ☒ 11 Continuous slot ☐ 01
_____ Other ☐
b. Manufacturer Diedrich
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.

11. Backfill material (below filter pack): None ☒ 14
_____ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Dave Kleber (for KEG)

Firm: KEY ENGINEERING GROUP, LTD.
W66 N215 Commerce Court Cedarburg, WI 53012
Tel: (414) 375-4750
Fax: (414) 375-9680

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State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Cottage Grove Citgo Quick Mart	Local Grid Location of Well: _____ ft. ☐N. ☐S. _____ ft. ☐E. ☐W.	Well Name: MW-9
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ° ' " Long. ° ' " or	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☒11; Piezometer ☐12	St. Plane _____ ft. N, _____ ft. E.	Date Well Installed: 12/8/98
Distance Well Is From Waste/Source Boundary: ft.	Section Location of Waste/Source: NW 1/4 of NW 1/4 of Sec. 10 T. 7 N, R. 10 ☒E. ☐W.	Well Installed By: (Person's Name and Firm): Dave Kleber; Key Engineering Group
Is Well A Point of Enforcement Std. Application? ☒ Yes ☐ No	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☒ Sidegradient; d ☐ Downgradient n ☐ Not Known	

A. Protective pipe, top elevation _____ ft. MSL
B. Well casing, top elevation _____ ft. MSL
C. Land surface elevation _____ ft. MSL
D. Surface seal, bottom _____ ft. MSL or 1.0 ft.

12. USC classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☒ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

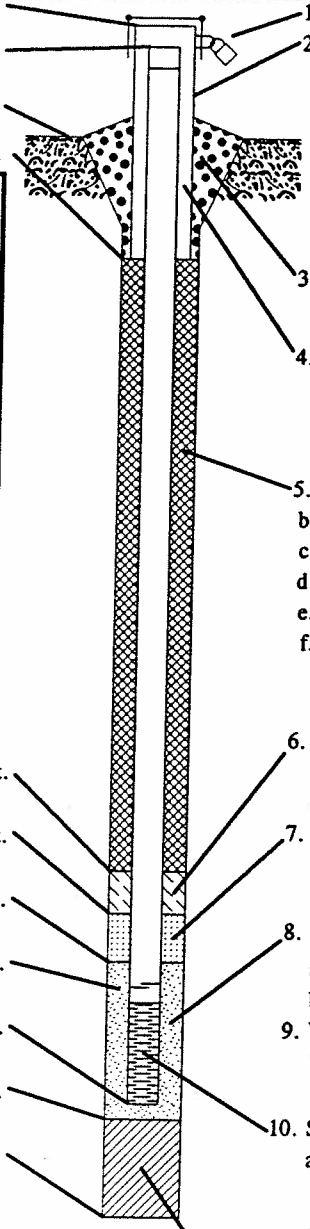
14. Drilling method used: Rotary ☐50; Hollow Stem Auger ☒41; _____ Other ☐

15. Drilling fluid used: Water ☐02 Air ☐01 Drilling Mud ☐03 None ☒99

16. Drilling additives used? ☐ Yes ☒ No
Describe N/A

17. Source of water (attach analysis):
N/A

E. Bentonite seal, top _____ ft. MSL or 1.0 ft.
F. Fine sand, top _____ ft. MSL or 4.0 ft.
G. Filter pack, top _____ ft. MSL or 5.0 ft.
H. Screen joint, top _____ ft. MSL or 6.0 ft.
I. Well bottom _____ ft. MSL or 16.0 ft.
J. Filter pack, bottom _____ ft. MSL or 16.5 ft.
K. Borehole, bottom _____ ft. MSL or 16.5 ft.
L. Borehole, diameter 8.25 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 10.0 in.
b. Length: 1.0 ft.
c. Material: _____ Steel ☒04 Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: _____
3. Surface seal: Bentonite ☐30 Concrete ☒01 _____ Other ☐
4. Material between well casing and protective pipe: Bentonite ☐30 Annular space seal ☐ Sand Other ☒
5. Annular space seal: a. Granular Bentonite ☐33
b. _____ Lbs/gal mud weight . . Bentonite-sand slurry ☐35
c. _____ Lbs/gal mud weight . . . Bentonite slurry ☐31
d. _____ % Bentonite . . . Bentonite-cement grout ☐50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐01 Tremie pumped ☐02 Gravity ☐08
6. Bentonite seal: a. Bentonite granules ☐33
b. ☐1/4 in. ☒3/8 in. ☐1/2 in. Bentonite pellets ☐32
c. CETCO PureGold Other ☒
7. Fine sand material: Manufacturer, product name and mesh size
a. Red Flint #45-55, 1/2-50 lb bag
b. Volume added 0.25 ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint #30, 6-50 lb bags
b. Volume added 3.0 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒23 Flush threaded PVC schedule 80 ☐24 _____ Other ☐
10. Screen material: PVC
a. Screen Type: Factory cut ☒11 Continuous slot ☐01 _____ Other ☐
b. Manufacturer Diedrich
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☒14 _____ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Dave Kleber (DJW) Firm: KEY ENGINEERING GROUP, LTD.
W66 N215 Commerce Court Cedarburg, WI 53012
Tel: (414) 375-4750 Fax: (414) 375-9680

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State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County	Well Name
Cottage Grove Citgo Quick Mart	Dane	MW-7
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
	13	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☒	51
pumped slowly	☐	50
other _____	☐	

3. Time spent developing well: 65 min.

4. Depth of well (from top of well casing): 17.43 ft.

5. Inside diameter of well: 2.00 in.

6. Volume of water in filter pack and well casing: 4.57 gal.

7. Volume of water removed from well: 8.00 gal.

8. Volume of water added (if any): 0.0 gal.

9. Source of water added: N/A

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	12.59 ft.	12.76 ft.
Date	b.	1/18/99	1/18/99
Time	c.	11:15 ☒ a.m. ☐ p.m.	12:20 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		2.00 inches	0.00 inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15	Clear ☒ 20 Turbid ☐ 25
(Describe)		Very cloudy light brown	Very slightly cloudy

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Additional comments on development:
Purged dry 4 times

Well developed by: Person's Name and Firm

Name: Kris King

Firm: Key Engineering Group

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Kristopher King

Print Initials: KTK

Firm: KEY ENGINEERING GROUP, LTD.

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County	Well Name
Cottage Grove Citgo Quick Mart	Dane	MW-8
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
	13	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☒	51
pumped slowly	☐	50
other _____	☐	

3. Time spent developing well: 50 min.

4. Depth of well (from top of well casing): 17.34 ft.

5. Inside diameter of well: 2.00 in.

6. Volume of water in filter pack and well casing: 4.65 gal.

7. Volume of water removed from well: 15.00 gal.

8. Volume of water added (if any): 0.0 gal.

9. Source of water added: N/A

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	12.42 ft.	12.50 ft.
Date	b.	1/18/99	1/18/99
Time	c.	12:45 ☐ a.m. ☒ p.m.	1:35 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		2.00 inches	0.00 inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15	Clear ☒ 20 Turbid ☐ 25
(Describe)		Very dark green-brown	Slightly cloudy

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Additional comments on development:
Purged dry 4 times

Well developed by: Person's Name and Firm

Name: Kris King

Firm: Key Engineering Group

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Kris King

Print Initials: KTK

Firm: KEY ENGINEERING GROUP, LTD.

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County	Well Name
Cottage Grove Citgo Quick Mart	Dane	MW-9
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
	13	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☒	51
pumped slowly	☐	50
other _____	☐	

3. Time spent developing well: 45 min.

4. Depth of well (from top of well casing): 15.98 ft.

5. Inside diameter of well: 2.00 in.

6. Volume of water in filter pack and well casing: 3.46 gal.

7. Volume of water removed from well: 18.00 gal.

8. Volume of water added (if any): 0.0 gal.

9. Source of water added: N/A

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	12.32 ft.	12.40 ft.
Date	b.	1/18/99	1/18/99
Time	c.	1:45 ☐ a.m. ☒ p.m.	2:30 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		1.00 inches	0.00 inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15	Clear ☒ 20 Turbid ☐ 25
(Describe)		Very brown turbid water	Slightly cloudy

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Additional comments on development:
Purged dry 4 times

Well developed by: Person's Name and Firm

Name: Kris King

Firm: Key Engineering Group

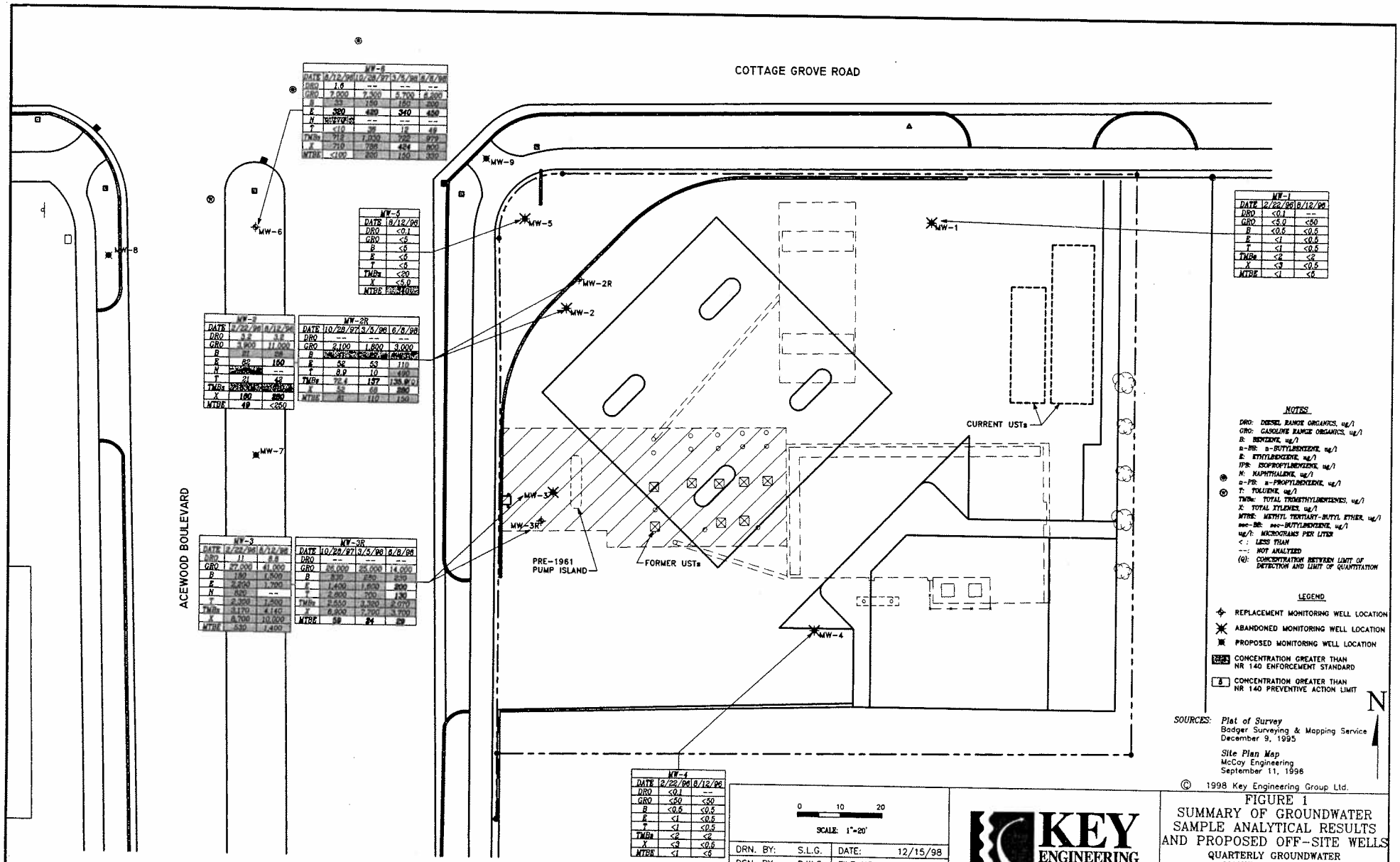
I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Kris King

Print Initials: KTK

Firm: KEY ENGINEERING GROUP, LTD.

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.



MW-8				
DATE	8/12/96	10/28/97	3/5/98	6/8/98
DRO	1.6	--	--	--
GRO	7,000	7,500	5,700	6,200
B	33	150	150	200
E	380	480	340	450
N	[illegible]	--	--	--
T	<10	38	12	49
TMBs	710	1,000	720	970
X	710	786	484	800
MTBE	<100	200	150	330

MW-5	
DATE	8/12/96
DRO	<0.1
GRO	<5
B	<5
E	<5
T	<5
TMBs	<20
X	<5.0
MTBE	[illegible]

MW-1		
DATE	2/22/96	8/12/96
DRO	<0.1	--
GRO	<5.0	<50
B	<0.5	<0.5
E	<1	<0.5
T	<1	<0.5
TMBs	<2	<2
X	<3	<0.5
MTBE	<1	<5

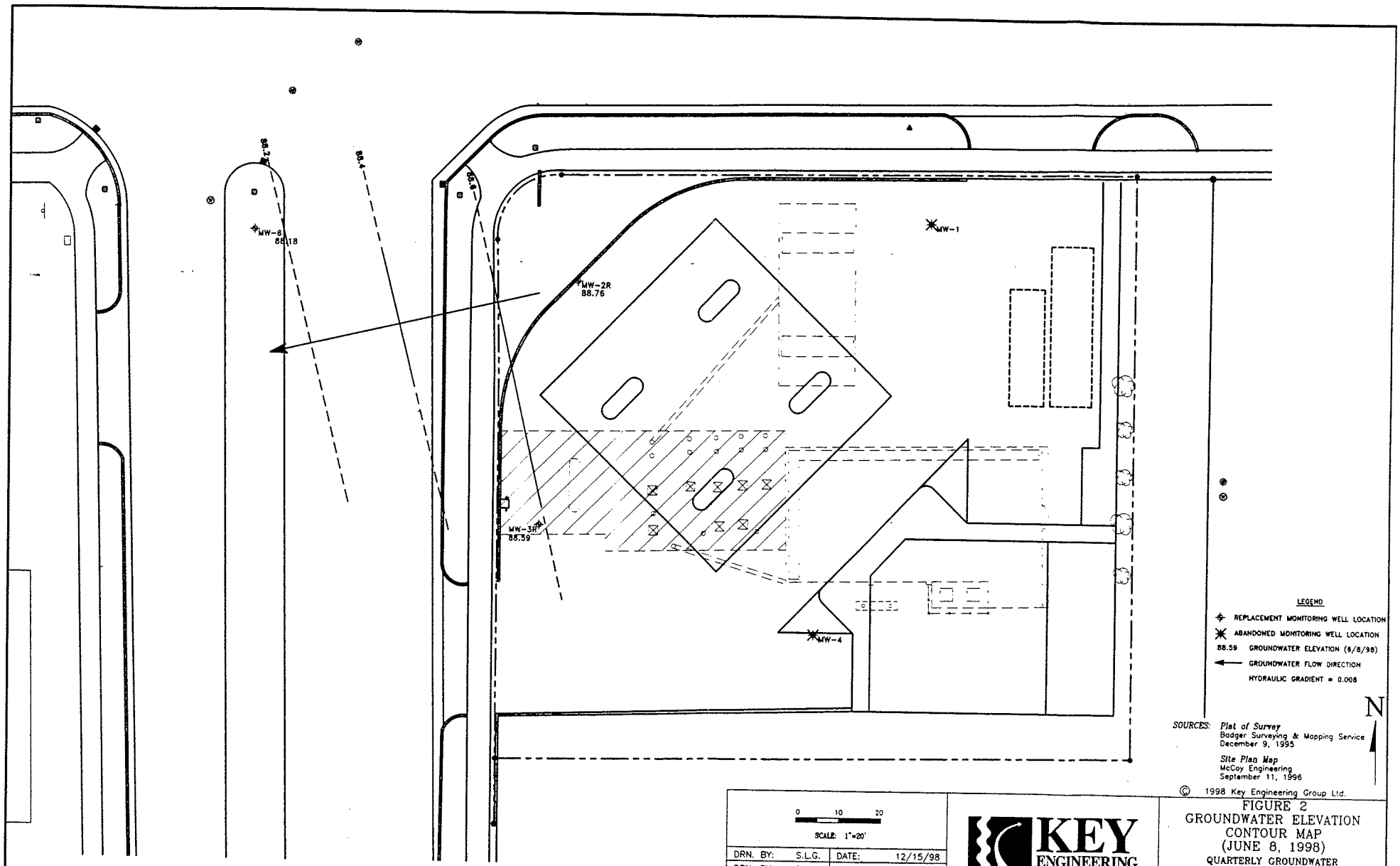
MW-6		
DATE	2/22/96	8/12/96
DRO	3.2	3.2
GRO	3,900	11,000
B	81	28
E	82	160
N	[illegible]	--
T	21	49
TMBs	[illegible]	[illegible]
X	150	280
MTBE	49	<250

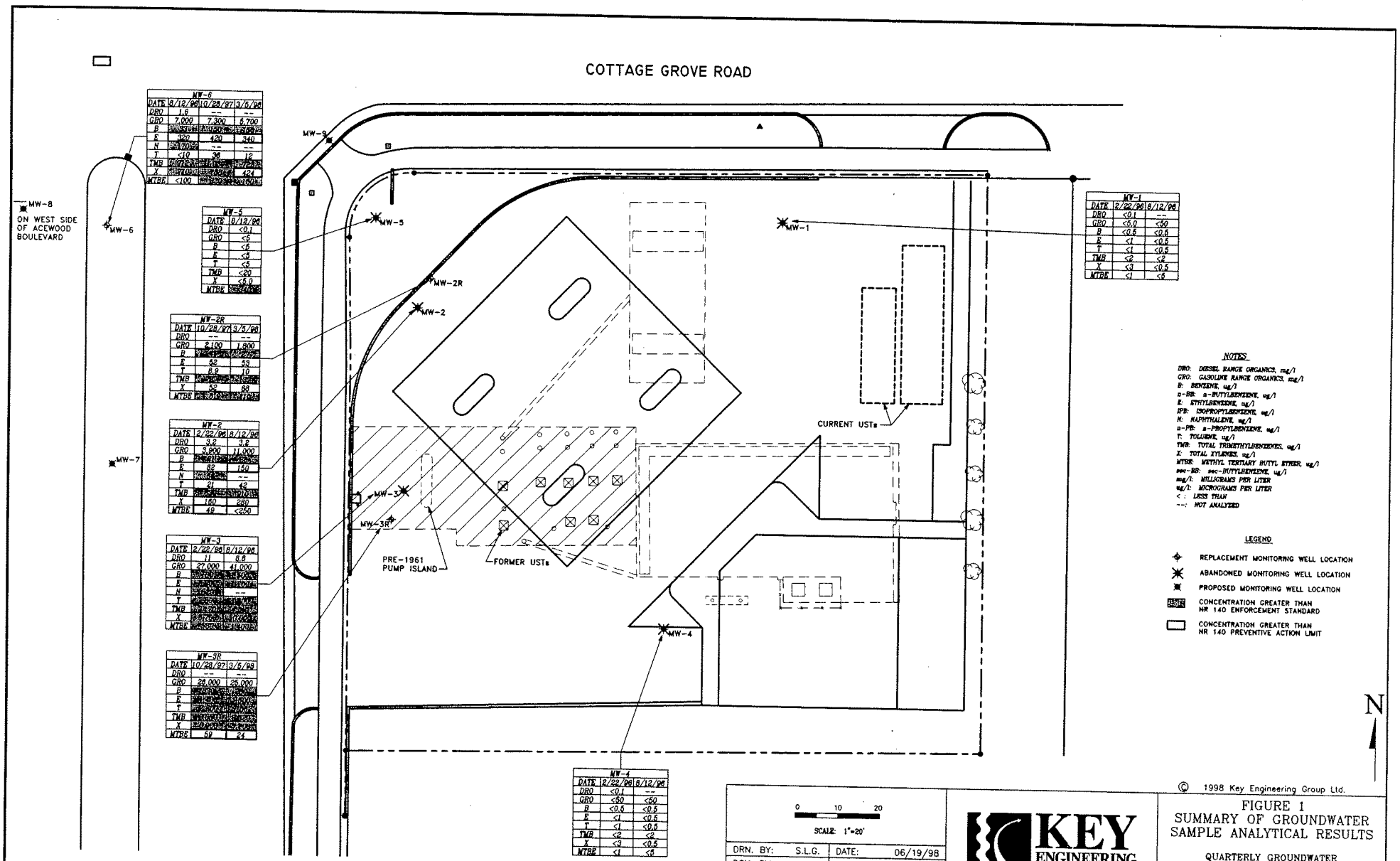
MW-2R			
DATE	10/28/97	3/5/98	6/8/98
DRO	--	--	--
GRO	2,100	1,800	3,000
B	[illegible]	[illegible]	[illegible]
E	52	53	110
T	8.9	10	490
TMBs	72.4	157	135 (Q)
X	56	69	390
MTBE	81	110	150

MW-7		
DATE	2/22/96	8/12/96
DRO	11	4.8
GRO	27,000	41,000
B	180	1,900
E	2,200	1,700
N	820	--
T	2,200	1,500
TMBs	3,170	4,140
X	8,700	10,000
MTBE	530	1,400

MW-3R			
DATE	10/28/97	3/5/98	6/8/98
DRO	--	--	--
GRO	25,000	25,000	14,000
B	830	[illegible]	800
E	1,400	1,600	1,900
T	2,900	700	130
TMBs	2,550	3,300	2,070
X	6,900	7,700	3,700
MTBE	58	84	59

MW-4		
DATE	2/22/96	8/12/96
DRO	<0.1	--
GRO	<50	<50
B	<0.5	<0.5
E	<1	<0.5
T	<1	<0.5
TMBs	<2	<2
X	<3	<0.5
MTBE	<1	<5


88.2
88.4
88.6
MW-6
88.18
MW-2R
88.76
MW-1
MW-3R
88.59
MW-4
LEGEND
REPLACEMENT MONITORING WELL LOCATION
ABANDONED MONITORING WELL LOCATION
88.59 GROUNDWATER ELEVATION (6/8/98)
GROUNDWATER FLOW DIRECTION
HYDRAULIC GRADIENT = 0.008
N
SOURCES: Plat of Survey
Badger Surveying & Mapping Service
December 9, 1995
Site Plan Map
McCoy Engineering
September 11, 1996
© 1998 Key Engineering Group Ltd.
0 10 20
SCALE: 1"=20'
DRN. BY: S.L.G. DATE: 12/15/98
DSN. BY: D.W.G. FILE NO.: 0511021
CHK. BY: V.S.V. DWG. NO.: 5110214
REV. BY: G.L.J. SHEET NO.: 2
KEY ENGINEERING GROUP LTD.
FIGURE 2
GROUNDWATER ELEVATION CONTOUR MAP
(JUNE 8, 1998)
QUARTERLY GROUNDWATER MONITORING REPORT
CITGO QUICK MART
4601 COTTAGE GROVE ROAD
MADISON, WISCONSIN



MW-6		
DATE	8/12/98	10/28/97	3/5/98
DRO	1.6	---	---
GRO	7,000	7,300	5,700
B	[illegible]	[illegible]	[illegible]
E	320	420	340
N	[illegible]	---	---
T	210	98	16
TMB	[illegible]	[illegible]	[illegible]
X	[illegible]	[illegible]	424
MTBE	<100	[illegible]	[illegible]

MW-5	
DATE	8/12/98
DRO	<0.1
GRO	<6
B	<6
E	<3
T	<3
TMB	<20
X	<6.0
MTBE	[illegible]

MW-2R		
DATE	10/28/97	3/5/98
DRO	---	---
GRO	2,100	1,900
B	[illegible]	[illegible]
E	52	53
T	8.9	10
TMB	[illegible]	[illegible]
X	52	68
MTBE	[illegible]	[illegible]

MW-2		
DATE	2/22/98	8/12/98
DRO	3.2	3.2
GRO	3,800	11,000
B	[illegible]	[illegible]
E	82	150
N	[illegible]	---
T	21	42
TMB	[illegible]	[illegible]
X	150	280
MTBE	49	<250

MW-3		
DATE	2/22/98	8/12/98
DRO	11	6.8
GRO	27,000	41,000
B	[illegible]	[illegible]
E	[illegible]	[illegible]
N	[illegible]	[illegible]
T	[illegible]	[illegible]
TMB	[illegible]	[illegible]
X	[illegible]	[illegible]
MTBE	[illegible]	[illegible]

MW-3R		
DATE	10/28/97	3/5/98
DRO	---	---
GRO	28,000	25,000
B	[illegible]	[illegible]
E	[illegible]	[illegible]
T	[illegible]	[illegible]
TMB	[illegible]	[illegible]
X	[illegible]	[illegible]
MTBE	59	24

MW-1		
DATE	2/22/98	8/12/98
DRO	<0.1	---
GRO	<5.0	<50
B	<0.5	<0.5
E	<1	<0.5
T	<1	<0.5
TMB	<2	<2
X	<3	<0.5
MTBE	<1	<5

MW-4		
DATE	2/22/98	8/12/98
DRO	<0.1	---
GRO	<50	<50
B	<0.5	<0.5
E	<1	<0.5
T	<1	<0.5
TMB	<2	<2
X	<3	<0.5
MTBE	<1	<5

NOTES

DRO: DIESEL RANGE ORGANICS, mg/l
GRO: GASOLINE RANGE ORGANICS, mg/l
B: BENZENE, ug/l
n-BB: n-BUTYLBENZENE, ug/l
E: ETHYLBENZENE, ug/l
IPB: ISOPROPYLBENZENE, ug/l
N: NAPHTHALENE, ug/l
n-PB: n-PROPYLBENZENE, ug/l
T: TOLUENE, ug/l
TMB: TOTAL TRIMETHYLBENZENES, ug/l
X: TOTAL XYLENES, ug/l
MTBE: METHYL TERTIARY BUTYL ETHER, ug/l
sec-BB: sec-BUTYLBENZENE, ug/l
mg/l: MILLIGRAMS PER LITER
ug/l: MICROGRAMS PER LITER
< : LESS THAN
---: NOT ANALYZED

LEGEND

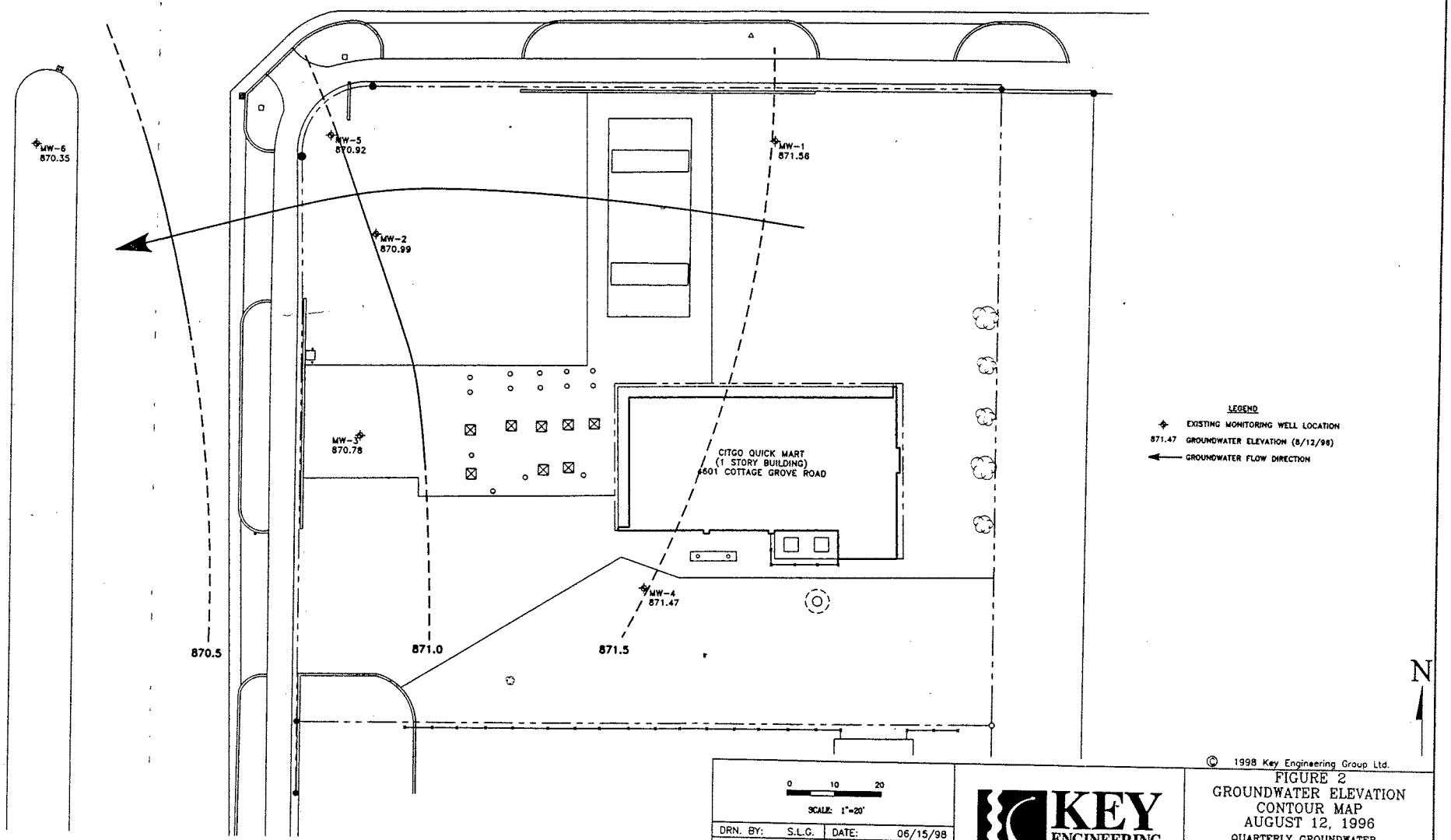
- REPLACEMENT MONITORING WELL LOCATION
- ABANDONED MONITORING WELL LOCATION
- PROPOSED MONITORING WELL LOCATION
- CONCENTRATION GREATER THAN NR 140 ENFORCEMENT STANDARD
- CONCENTRATION GREATER THAN NR 140 PREVENTIVE ACTION LIMIT

DRN. BY:	S.L.G.	DATE:	06/19/98
DSN. BY:	D.W.G.	FILE NO.:	0511021
CHK. BY:	V.S.V.	DWG. NO.:	5110213
REV. BY:	G.L.J.	SHEET NO.:	1

KEY ENGINEERING GROUP LTD.

FIGURE 1
SUMMARY OF GROUNDWATER SAMPLE ANALYTICAL RESULTS

QUARTERLY GROUNDWATER MONITORING REPORT
CITGO QUICK MART
4601 COTTAGE GROVE ROAD
MADISON, WISCONSIN



0 10 20

SCALE: 1"=20'

DRN. BY:	S.L.G.	DATE:	06/15/98
DSN. BY:	D.W.G.	FILE NO.:	0511021
CHK. BY:	V.S.V.	DWG. NO.:	05110218
REV. BY:	G.L.J.	SHEET NO.:	2

KEY ENGINEERING GROUP LTD.

FIGURE 2
GROUNDWATER ELEVATION CONTOUR MAP
AUGUST 12, 1996

QUARTERLY GROUNDWATER MONITORING REPORT
CITGO QUICK MART
4601 COTTAGE GROVE ROAD
MADISON, WISCONSIN

Key ENVIRONMENTAL SERVICES, INC.

W66 N215 Commerce Court, Cedarburg, WI 53012 • (414) 375-4750 • (800) 645-7365 • Fax (414) 375-9680
6220C Washington Avenue, Racine, WI 53406 • (414) 886-4439 • Fax (414) 886-4675

SITE INVESTIGATION AND REMEDIAL ACTION OPTIONS REPORT

COTTAGE GROVE QUICK MART
4601 COTTAGE GROVE ROAD
MADISON, WISCONSIN 53716

September 10, 1996

PREPARED FOR:

FRANCOIS OIL COMPANY, INC.
BELLEVILLE, WISCONSIN

SITE INVESTIGATION AND REMEDIAL ACTION OPTIONS REPORT

COTTAGE GROVE QUICK MART
4601 COTTAGE GROVE ROAD
MADISON, WISCONSIN 53716

September 10, 1996

KEY ENVIRONMENTAL SERVICES, INC.

Virendra S. Verma, P.G.
Project Geologist

Douglas W. Graham, P.E.
Senior Project Manager

NR 700 SUBMITTAL CERTIFICATIONS

"I, Gregory A. Konicek, hereby certify that I am a hydrogeologist as that term is defined in the Wisconsin Administrative Code (WAC), Chapter NR 712.03 (1), and that, to the best of my knowledge, all of the information contained in this document is correct and the document was prepared in compliance with all applicable requirements in Chapters NR700 to 726 of the WAC."

Signature and title

9/10/96
Date

"I, Douglas W. Graham, hereby certify that I am a registered professional engineer in the State of Wisconsin, registered in accordance with the requirements of Chapter A-E 4, of the Wisconsin Administrative Code (WAC); that this document has been prepared in accordance with the Rules of Professional Conduct in Chapters A-E 8, of the WAC; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in Chapters NR700 to 726, of the WAC."

SENIOR PM
Signature and title

Stamp

9/10/96

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- 1.2 Objective and Scope of Site Investigation 2
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EXECUTIVE SUMMARY

Soil and groundwater impacted with petroleum constituents were encountered at the Cottage Grove Quick Mart site. The detected analytes are likely associated with on-site underground storage tank (UST) systems.

The objective of the site investigation (SI) was to define the vertical and horizontal extent of petroleum contamination in soil and groundwater due to on-site sources. A total of 15 soil borings were advanced during the SI. Six (6) of the soil borings were converted to groundwater monitoring wells.

The results of the site investigation activities indicated concentrations of petroleum volatile organic compounds (PVOCs) in on-site soil. Site-specific Residual Contaminant Levels (RCLs) were calculated for the on-site soils; however, the results of this evaluation, including the sensitivity analysis, indicated that the site-specific RCLs for the petroleum compounds were lower than the established Generic RCLs. Therefore, in accordance with NR 720.09(3), Generic RCLs will be used to evaluate remedial actions at the site. It is estimated that 4,000 tons of impacted soils are present on-site that exceed Generic RCLs. The SI results also indicated that on-site and off-site groundwater is impacted with PVOCs at concentrations exceeding their respective NR 140 groundwater quality standards.

The objective of the remedial action options (RAO) evaluation was to determine the most technically and economically feasible remedial actions for the site that will result in a reduction in the mobility and concentration of contaminants to levels that are protective of human health, safety and welfare, and the environment. Based on this evaluation, the following RAOs were selected for the site:

- Source Removal — *Excavation and Off-Site Bio-Pile Treatment*
- Natural Attenuation — *Natural Attenuation/Groundwater Monitoring*

It is likely that natural attenuation will be effective in reducing residual contaminant concentrations in groundwater to applicable NR 140 groundwater quality standards in a "reasonable period of time" following completion of the selected source control RAO. If based on the results of post source control groundwater monitoring, residual contaminants within the groundwater are not naturally attenuating, active groundwater control/remediation technologies will be evaluated.

1.0 INTRODUCTION

This *Site Investigation and Remedial Action Options (SI/RAO) Report* for the Cottage Grove Quick Mart in Madison, Wisconsin was prepared for and is being submitted on behalf of Mr. Ed Francois to the Wisconsin Department of Natural Resources (WDNR) by Key Environmental Services, Inc. (KEY). This report was prepared in accordance with Chapters NR 716 and NR 726 of the Wisconsin Administrative Code (WAC). Section 1.0 presents the purpose, objectives, and scope of the site investigation (SI) and the objective and scope of the remedial action option (RAO) evaluation.

1.1 Purpose of Site Investigation

Analytical results of a soil sample collected during a December 19, 1995 preliminary investigation indicated that a petroleum release from past or present underground storage tanks (USTs) had occurred. The WDNR was notified of this data and subsequently specified in a letter dated January 2, 1996, that Mr. Ed Francois conduct a SI in accordance with NR 716. The WDNR letter is included in Appendix 1.

1.2 Objective and Scope of Site Investigation

The objective of the SI was to define the vertical and horizontal extent of contamination in soil and groundwater due to on-site sources.

The objective of the SI was met by collecting and analyzing soil and groundwater samples from soil borings and groundwater monitoring wells. The soil and groundwater samples were analyzed for applicable petroleum parameters identified in the *WDNR Leaking Underground Storage Tank (LUST) Analytical and Quality Assurance Guidance*. The soil sample results were compared to the allowable generic residual contaminant levels (RCLs) specified in NR 720. The groundwater analytical results were compared to NR 140 groundwater preventive action limits (PALs) and enforcement standards (ESs).

1.3 Objective and Scope of the RAO Evaluation

The objective of the RAO evaluation was to systematically determine the most technically and economically feasible remedial actions for the site that will result in a reduction in the mobility and concentration of contaminants to levels that are protective of human health, safety and welfare, and the environment. The RAO evaluation for the Cottage Grove Quick Mart site consisted of the following:

- Evaluating applicable site history and SI data.
- Developing a conceptual site model based on the SI data and potential receptors.
- Developing remedial action objectives based on the site conceptual model.
- Developing general remedial options to address the remedial action objectives.
- Identifying and screening remedial action technologies based on the contaminants present and site characteristics in accordance with Chapter NR 722.07(2).

- Developing RAOs for each remedial action objective based on the results of the technology identification and screening process.
- Performing an evaluation of developed RAOs according to technical and economic feasibility criteria specified in NR 722.07(4).
- Selecting and describing the most technically and economically feasible RAO in accordance with NR 722.13(2) (e).

2.0 GENERAL INFORMATION

2.1 Site Investigation Contacts

The owner and contact person for the site is Mr. Ed Francois.

Owner
Mr. Ed Francois
Francois Oil Company, Inc.
128 West Main Street
Belleville, Wisconsin 52508
Phone: (608) 424-3375
Fax: (608) 424-6154

KEY was contracted by Mr. Ed Francois to conduct the SI. The KEY contact person is:

Environmental Consultant
Mr. Virendra S. Verma, Project Geologist
Key Environmental Services, Inc.
W66 N215 Commerce Court
Cedarburg, Wisconsin 53012
Phone: (414) 375-4750
Fax: (414) 375-9680

The SI drilling contractors were:

Drilling Contractors

Sauter Drilling
12777 West Silver Spring Road
Butler, Wisconsin 53007
Phone: (414) 783-5002

Briohn Environmental Contractors, Inc.
W233 N2800 Roundy Circle W., Suite 101
Pewaukee, Wisconsin 53072
Phone: (414) 524-2080
Fax: (414) 524-2085

The SI analytical contractors were:

Analytical Contractors

Great Lakes Analytical
1380 Busch Parkway
Buffalo Grove, Illinois
Phone: (847) 808-7766
Fax: (847) 808-7772

National Environmental Testing, Inc.
NET Midwest Division
602 Commerce Drive
P.O. Box 288
Watertown, Wisconsin 53094
Phone: (414) 261-1660
Fax: (414) 261-8120

2.2 Site Location

The site is located at 4601 Cottage Grove Road, Madison, Wisconsin. The site is situated in the northwest ¼ of the northwest ¼ of U.S. Public Survey Section 10, Township 7 North, Range 10 East, Dane County, Wisconsin. The site location is depicted on Figure 1.

2.3 Site Description

The site property is approximately ½-acre in size and is used as a gasoline service station and food mart. The property is bounded to the south by an apartment complex, to the north by Cottage Grove Road, to the west by Acewood Boulevard and to the east by a private residence. The site layout is depicted on Figure 2.

3.0 BACKGROUND INFORMATION

Five (5) 4,000-gallon unleaded gasoline USTs, one (1) 550-gallon waste oil UST and one (1) 550-gallon fuel oil UST are located on the subject property. Two (2) dispensing islands are associated with the present gasoline UST systems. A preliminary Geoprobe® boring was advanced on the property on December 19, 1995 which was observed and documented by KEY. Based upon the laboratory analysis of the soil sample collected, a release was reported to the WDNR, who subsequently required a SI in accordance with Chapter NR 716.

The site originally contained USTs in a tank cavity covered by a pump island on the west edge of the property prior to 1961. In 1961, four (4) 4,000-gallon unleaded gasoline USTs were installed adjacent to and east of the old tank cavity. The pump islands were moved to the north edge of the property. A fifth UST was installed in approximately 1973 when the supply lines were upgraded. The waste oil and fuel oil USTs were installed in 1961. Tank inventory forms are included in Appendix 1.

Due to the presence of petroleum products identified during the preliminary investigation, Mr. Ed Francois, owner of Francois Oil Company, Inc., retained KEY to delineate the vertical and lateral extent of petroleum constituents in soil and groundwater.

3.1 Previous Environmental Reports

KEY has completed and submitted the following report on behalf of Mr. Ed Francois for the Cottage Grove Quick Mart site: *Site Investigation Work Plan*, Key Environmental Services, Inc. (KEY File No. 0511021), February 8, 1996.

4.0 SITE INVESTIGATION PROCEDURES AND ACTIVITIES

4.1 General

The SI involved advancing soil borings, collecting soil samples, installing groundwater monitoring wells, developing and sampling the groundwater monitoring wells and evaluating the soil and groundwater analytical results. The SI was completed during the months of February through August 1996. A total of 15 soil borings were advanced during the SI. The locations of the soil borings are depicted on Figure 2.

The following is a chronological list of activities that were conducted during the SI.

- On February 8, 1996, KEY submitted a Work Plan to the WDNR.
- On February 15 and 16, 1996 nine (9) soil borings were advanced (B-1 through B-9) and four (4) groundwater monitoring wells were constructed. Soil and groundwater samples were collected to determine the vertical and horizontal extent of contamination. Analytical and field data indicated that the horizontal extent of contamination was not defined.
- On July 15, 1996, the on-site groundwater monitoring wells were slug tested to gather information to calculate the on-site hydraulic conductivity.
- On July 29, 1996, six (6) additional soil borings (two (2) were converted to groundwater monitoring wells) were advanced at the site. Two (2) of the soil borings (one (1) was converted to a well) were advanced off-site to evaluate the horizontal extent of potential off-site impacts. Four (4) of the soil borings were advanced on-site. One (1) soil boring was advanced at the northwest property boundary and converted to a groundwater monitoring well to determine the horizontal extent of groundwater impacts, and one (1) soil boring was advanced by the fueling island. Two (2) of the soil borings were advanced to identify potential impacts in shallow soils.

4.2 Soil Borings and Soil Sampling

On February 15 and 16, 1996, Sauter Drilling Inc. advanced nine (9) soil borings (B-1 through B-9) using a CME-45 drill rig. An 18-inch long, 2-inch diameter stainless steel split-spoon sampler was driven ahead of the hollow stem augers (HSAs) to the desired sampling depth. On July 29, 1996, Briohn Environmental Contractors, Inc. advanced four (4) soil borings (B-10 through B-13) and converted two (2) of the soil borings to groundwater monitoring wells in a similar manner as to the installation by Sauter Drilling Inc. Soil samples were collected at two (2) foot intervals to depths ranging from eight (8) feet to 20 feet below ground surface (bgs).

Two (2) additional soil borings were advanced on-site on July 29, 1996. These two (2) soil borings were identified as B-4N and B-9N. They were located near soil borings B-4 and B-9 and far enough away to collect representative soil samples. These soil borings were advanced to approximately 10 feet bgs to collect shallow soil samples that were representative of soils

associated with the old tank cavity. Soil samples previously collected from borings B-4 and B-9 were analyzed at depths which could not effectively evaluate the degree of shallow soil impacts.

Soil samples were classified in accordance with the Unified Soil Classification System (USCS). Soil boring logs were maintained by KEY to document the depth and thickness of each soil stratum; a description of each soil stratum including color, soil moisture, density or consistency, and olfactory observations; sample depth interval, blow count number and percent (%) recovery; field screening results, samples selected for laboratory analysis. The soil boring logs and borehole abandonment forms are included in Appendix 2.

A portion of each soil sample was placed into laboratory-supplied containers with the appropriate preservative and stored on ice for potential subsequent laboratory analysis. The remaining portion of the sample was placed into a resealable bag for field screening.

4.3 Soil Field Screening

The soil samples were field screened using a model 580B Organic Vapor Meter (OVM) photo-ionization detector (PID) equipped with a 10.6 electron volt (eV) lamp, calibrated to isobutylene. The tip of the PID was inserted into the slightly opened resealable bag and the highest reading was recorded. PID readings are shown on the boring logs in Appendix 2 and on Table 1. PID calibration sheets are included in Appendix 2.

4.4 Groundwater Monitoring Well Installation, Development and Sampling

The groundwater monitoring wells were installed in the soil borings. The soil borings were drilled with 4 ¼-inch diameter HSAs which resulted in an 8 ¼-inch diameter borehole. The wells were then constructed in the boreholes using 2-inch diameter polyvinyl chloride (PVC) riser and screen. The wells were constructed using a 10-foot long screen such that the well screen intersected the water table. The wells were then completed as flush mounted wells in accordance with the regulations.

The groundwater monitoring wells were installed in accordance with the regulations and were used to determine the impacts to groundwater as well as for determining the groundwater elevations and flow direction. The monitoring well construction forms and the well development forms are provided in Appendix 3.

The wells were developed by surging and purging the wells with the bailer. The water in the wells was then purged such that 10 volumes were removed. The wells were sampled using a 2-inch diameter Teflon® bailer. The wells were first purged for development and then sampled.

4.5 Laboratory Analysis of Soil and Groundwater Samples

Soil and groundwater samples were obtained by KEY and submitted, along with chain of custody documentation, for laboratory analysis to National Environmental Testing (NET) and Great Lakes Analytical (GLA) for the different rounds of analysis. The soil and groundwater samples were analyzed for the applicable parameters specified for petroleum compounds in the *WDNR LUST and*

Petroleum Analytical and Quality Assurance Guidance. The soil samples were analyzed for diesel range organics (DRO), gasoline range organics (GRO), volatile organic compounds (VOCs), and total lead. Soil samples collected from B-3 also were analyzed for cadmium and polychlorinated biphenyls (PCBs) due to the presence of the waste oil UST. The groundwater samples were analyzed for DRO, GRO, VOCs and/or petroleum volatile organic compounds (PVOCs) and dissolved lead.

4.6 Hydraulic Conductivity Testing

Three (3) on-site groundwater monitoring wells (MW-1, MW-2 and MW-4) were slug-tested for calculating hydraulic conductivity. The procedure entailed using a 1.5-inch diameter solid PVC slug and letting the slug fall into the well while a pressure transducer was used to record the water level as the water level fell and returned to static. Additionally, the slug is placed into the water and the well is left to allow the water level to return to static. The slug is then removed and the water levels are recorded as the water returns (rises) to static. The water levels in all on-site wells are recorded before any testing is started. The water levels during the test are recorded using a pressure transducer which can record variations in pressure and therefore water levels to 0.001 foot.

4.7 Quality Assurance/Quality Control

The HSAs, drill rods, and split-spoon samplers were decontaminated between drilling locations to avoid cross-contamination. The split-spoon sampler was decontaminated between each use with a tap water and detergent (Alconox®) wash and tap water rinse.

The water level indicator, the sampling equipment and hydraulic conductivity testing equipment were cleaned with an Alconox® and tap water wash followed by a distilled water rinse before being used at the site and also between wells. Field duplicate samples, trip blanks and field blanks were used to help determine sampling precision and accuracy.

KEY followed proper chain of custody procedures. Each sample was identified and labeled with a field sample identification number consisting of a project identifier, a sample location identifier, and a sample number identifier.

KEY followed analytical methods, container requirements, holding times, and sample preservation procedures specified in *WDNR LUST and Petroleum Analytical and Quality Assurance Guidance* and WDNR "*Revised GRO and DRO Methods Effective March 1, 1996.*"

4.8 Documentation

The soil sampling, borehole abandonment, and well construction, development, and sampling were documented in the field by a KEY representative using the following field forms:

- Daily Field Notes
- Soil Boring Log Information Form (WDNR Form 4400-122)
- Well/Drillhole/Borehole Abandonment Form (WDNR Form 3300-5W)
- Monitoring Well Construction Form (WDNR Form 4400-113A)
- Monitoring Well Development Form (WDNR Form 4400-113B)
- PID Calibration Sheet

5.0 SITE INVESTIGATION RESULTS

5.1 General

The SI was conducted to determine the vertical and horizontal extent of soil and groundwater contamination associated with the use of the UST systems on-site. The SI included the drilling of 15 soil borings and the installation of six (6) groundwater monitoring wells. This section describes the subsurface conditions encountered and presents the laboratory analytical results for the soil and groundwater samples.

5.2 Site Geology

The soils encountered during the SI generally consisted of medium dense to dense, brown silty fine to coarse sand with trace gravel, underlain by clayey silt and gravel. In some locations clayey silt extends upward to 8-9 feet below grade. Silty sand with fine to coarse sand is distinct in all borings, throughout the property. The general site geology is depicted in a schematic cross-section on Figure 4.

5.3 Site Hydrogeology

The depth to groundwater at the site generally varies from 10 to 13 feet bgs. The depth to groundwater and the groundwater elevation data for site monitoring wells is summarized in Table 2. Groundwater generally flows to the west as depicted on the groundwater elevation contour map included as Figure 6. The average hydraulic gradient in the direction of groundwater flow is approximately 0.008 feet/foot.

The in-situ hydraulic conductivity (slug-test) data was evaluated with AQTESOLV® software. The results of the testing indicate a mean (geometric) site specific hydraulic conductivity of 4.9×10^{-4} cm/sec. Assuming an effective porosity of 0.40, the velocity of groundwater flow is less than 1 foot per year.

5.4 Soil Sample Field Screening and Analytical Results

Two (2) soil samples were collected from 13 of the 15 soil borings and 1 soil sample was collected from 2 of the 15 soil borings and submitted to a Wisconsin certified analytical laboratory. The soil samples were chosen based upon field observations, subsurface conditions and PID readings obtained during the field screening (Table 1). The soil samples were submitted for laboratory analysis based upon the type of USTs present and in accordance with the *WDNR LUST Analytical and Quality Assurance Guidance.*

Soil samples were submitted to NET and GLA for analysis of DRO, GRO, VOCs, PCBs, total lead and cadmium as appropriate. Soil analytical results are summarized in Table 1 and on Figure 5. The laboratory Analytical Reports and chain of custody documentation for soil are included in Appendix 4.

Concentrations of xylenes exceeding the allowable NR 720 RCLs were detected in one (1) of the soil samples: B-9 (6,800 milligrams per kilogram (mg/kg) at 13.5 to 15 feet). Other constituents (PVOCs) were detected in high concentrations within soils analyzed from B-4, B-4N, B-5, B-9, B-9N, and B-11. Concentrations of GRO and/or DRO were detected above their Generic RCL of 100 mg/kg at B-4, B-5 and B-9. Additionally, because high PVOC concentrations were detected, site-specific RCLs were calculated for 1,2,4-trimethylbenzene (1,2,4-TMB) and 1,3,5-trimethylbenzene (1,3,5-TMB). Concentrations of 1,2,4-TMB and 1,3,5-TMB exceed their respective calculated site-specific RCL at soil borings B-4, B-4N, B-5, B-9 and B-9N.

5.5 Groundwater Sampling and Analytical Results

The groundwater analytical results are summarized in Table 3 and shown on Figure 7. The laboratory results indicate the presence of contaminants above their respective NR 140 PAL or ES in on-site monitoring wells MW-2, MW-3 and MW-5, and off-site monitoring well MW-6. These compounds include benzene, ethylbenzene, naphthalene, toluene, xylenes and methyl-tert-butyl-ether (MTBE). The laboratory Analytical Reports and chain of custody documentation for the groundwater data are included in Appendix 6.

6.0 SITE CONCEPTUAL MODEL AND REMEDIAL ACTION OBJECTIVES

A site conceptual model was developed based on the following information to establish the basis for selecting appropriate remedial action objectives:

- Soil and groundwater remedial action target areas.
- Potential exposure and migration pathways.
- Proximity of contamination to receptors including current and potential use of the aquifer.

6.1 Remediation Target Areas

The soil is impacted by PVOCs at concentrations greater than the NR 720 Generic RCLs. Groundwater also is impacted by gasoline constituents. Because GRO consists of compounds between MTBE and Naphthalene, RCLs were calculated for PVOCs which are the primary constituents between MTBE and Naphthalene. Therefore, site-specific soil RCLs were calculated for benzene, ethylbenzene, toluene, xylene (BETX) and 1,2,4-TMB and 1,3,5-TMB. The site-specific RCLs were based on protection to groundwater in accordance with the requirements of NR 720. The NR 140 PALs for these compounds were used as a basis for this evaluation. Additionally, significant concentrations of GRO are present in groundwater. Therefore a PAL was calculated for TMBs using Draft WDNR guidance.

Because the soil contamination is in the capillary zone just above the groundwater table, contaminant leaching from soil to groundwater at the site is predominantly based on soil:water partitioning. Soil:water partitioning is a function of the organic carbon:water partitioning coefficient (K_{oc}) for the compounds and the organic carbon content (f_{oc}) of the soil.

The soil: water partitioning equation presented in a recent Draft WDNR guidance document was utilized for this evaluation. The dilution factor presented in NR 720.09(3)(b) was applied to this equation to account for the dilution of the contaminant in the groundwater mixing zone under the area of impacted soil. Site specific hydraulic conductivity and gradient data were used in calculating this dilution factor.

A sensitivity analysis was performed to determine how the equation results are influenced by a potential variation in input parameter values. The range of values used for the sensitivity parameters was based on applicable ranges presented in the literature or based on a typical variation in the parameter. K_{oc}, f_{oc}, and hydraulic conductivity were varied during the sensitivity analysis.

The results of this evaluation, including the sensitivity analysis, indicated that the site-specific RCLs for the PVOCs were lower than their respective Generic RCLs. Supporting documentation is provided in Appendix 7. Therefore, in accordance with NR 720.09(3), Generic RCLs will be used for the site. The estimated extent of soil impacts is depicted on Figure 5. Based on this area and an average thickness of soil contamination of 6 feet, it is estimated that 4,000 tons of soils are present on the site that will require source removal due to the exceedence of established Generic RCLs.

Site groundwater was encountered at a depth of approximately 10 to 13 feet bgs. PVOCs were detected in four (4) groundwater monitoring wells at concentrations above their respective ESs. The estimated extent of groundwater impacts known at this time is depicted on Figure 7. The full extent of groundwater impacts will likely need to be further delineated off-site.

6.1.1 Potential Exposure and Migration Pathways

Since the contaminated soil is covered with an asphalt surface and areas of overburden soil, there is no direct contact risk to petroleum contaminants. Therefore, exposure to groundwater is the applicable exposure pathway. Migration pathways associated with this exposure pathway include vertical migration with infiltration through the unsaturated zone, and lateral and vertical migration with the horizontal and vertical hydraulic gradients within the saturated zone. The silty clay layer encountered at approximately 16 feet bgs likely acts as a barrier to the potential vertical migration of contaminants to other groundwater zones.

6.1.2 Proximity to Potential Receptors

The area immediately surrounding the site is serviced by City of Madison municipal water. Therefore, there is likely no current or future threat to potential receptors or to water supplies from the contaminants at the site.

6.2 Remedial Action Objectives

Based on the conceptual model, the following remedial action objectives were developed:

- Eliminate the source to further groundwater impacts by remediating\removing contaminated soils in the soil remedial action target area.
- Achieve NR 140 groundwater quality standards in on-site and off-site groundwater within a "reasonable period of time."

7.0 IDENTIFICATION AND SCREENING OF REMEDIAL ACTION TECHNOLOGIES

7.1 General

General remedial actions were identified that address the remedial action objectives. Potentially applicable technologies were then identified for each general remedial action. The technologies were evaluated with respect to the conceptual model and either were retained or not retained for development of RAOs. The remedial action technology identification and screening process are described below.

7.2 Source Control Technologies

7.2.1 Natural Attenuation

Natural subsurface processes such as dilution, volatilization, biodegradation, adsorption, and chemical reactions with subsurface materials would reduce contaminant concentrations to acceptable levels over time. Given the high concentrations of contaminants in soil and the associated concentrations in groundwater, natural attenuation would not be an appropriate source control technology for the soils. Therefore, this technology is not retained for development of soil RAOs.

7.2.2 Excavation of Impacted Soil

This technology would consist of excavating the impacted soil in the soil remedial action target area. The area and depth of excavation would be based on Chapter NR 720 Generic RCLs. The area of soil contamination is generally accessible to standard excavation methods. This technology is retained for development of RAOs.

7.2.3 Landfill Disposal

Landfill disposal consists of transportation of excavated soils to an appropriately licensed landfill for disposal. Petroleum-contaminated soils can be landfilled as a special waste. WDNR approval is required to landfill volumes of contaminated soil in excess of 2,000 cubic yards. This technology is retained for development of RAOs.

7.2.4 Off-Site Bio-Pile Treatment

Off-site bio-pile treatment consists of transporting excavated soils to an active bio-pile at an appropriately licensed off-site facility. Bio-pile treatment consists of placing excavated soils in bio-piles and mixing the soils with bulking materials and organic matter to stimulate the aerobic biodegradation of the contaminants. PVOCs are generally biodegradable. This technology is retained for development of RAOs.

7.2.5 Thermal Desorption

Thermal desorption consists of thermal treatment of excavated soils using either an appropriately licensed mobile unit on-site or an off-site licensed facility. This technology consists of heating the soils to temperatures sufficient to volatilize and desorb contaminants from the soil. The volatilized contaminants are generally treated in a secondary treatment unit prior to discharge to the atmosphere. This technology has proven effectiveness for soils impacted with PVOCs. There is insufficient area to accommodate an on-site treatment unit; however, off-site thermal desorption is a viable technology and is retained for development of RAOs.

7.2.6 Soil Vapor Extraction

Soil vapor extraction (SVE) consists of applying a vacuum to the unsaturated zone soil in the soil remedial action target area using a network of extraction wells to create a negative pressure gradient that causes contaminants to volatilize and move toward the extraction wells. PVOCs at the site are amenable to SVE; however, the most significant soil PVOC impacts exist in the capillary zone just above the water table. Therefore, SVE is not retained for development of RAOs.

7.2.7 Engineering Controls

Engineering controls would consist of infiltration reduction through application of a low permeability cap over the soil remedial action target area. The reduction of infiltration would subsequently result in a reduction in contaminant migration from the unsaturated zone to the groundwater. This technology would be consistent with Chapter NR 720 Performance Standard (NR 720.19(2)) and would likely require a land use restriction on the property deed and the implementation of an inspection and monitoring program. Given the concentrations of PVOCs already in groundwater and the soil concentrations in the capillary fringe, this technology would not be appropriate for the site; therefore, engineering controls will not be retained for development of RAOs.

7.3 Groundwater Control and Remediation Technologies

Groundwater is impacted at the site with PVOC concentrations greater than their respective ESs.

Natural subsurface processes such as dilution, volatilization, biodegradation, adsorption, and chemical reactions with subsurface materials would reduce groundwater contaminant concentrations to acceptable levels. WDNR, through its proposed "flexible closure" procedures, recognizes natural attenuation as a viable groundwater remedial action technology provided the following criteria are met:

- Adequate "source control" has been implemented as necessary to prevent additional release of contamination to groundwater in excess of the NR 140 groundwater quality standards.
- Natural attenuation processes are causing a reduction in the mass and concentration of the groundwater contamination.
- The NR 140 groundwater quality standards will be attained within a "reasonable period of time."

- Groundwater contamination in excess of the NR 140 groundwater quality standards is not present off-site.
- There is no threat to human health and the environment as a result of selecting this remedial action option.

Implementation of groundwater use restrictions would be necessary with natural attenuation until groundwater quality standards are achieved. It is likely that following source control, the extent of residual groundwater contaminants will attenuate naturally in a "reasonable period of time." Additionally, a groundwater sump may be placed in the old (Pre-1961) tank cavity to allow for groundwater collection and removal and minimize continued off-site migration. Therefore, natural attenuation will be retained for development of RAOs.

The groundwater impacts at the site meet the criteria necessary to implement natural attenuation except that off-site groundwater is impacted. Adequate source control will be implemented which should reduce on-site groundwater contaminants, and therefore inhibit an increase in off-site contaminant concentrations.

8.0 DEVELOPMENT AND EVALUATION OF REMEDIAL ACTION OPTIONS

8.1 General

In this section, the remedial action technologies retained in Section 7.0 for source control and groundwater control/remediation are assembled into appropriate RAOs. Development of RAOs consisted of combining the retained technologies into RAOs that meet the remedial action objectives and are appropriate with respect to the conceptual model. The developed RAOs are then evaluated individually with respect to technical and economic feasibility in accordance with the criteria specified in NR 722.07. Following this evaluation, the RAOs were evaluated using the NR 722.07 criteria and a quantitative weighted ranking system.

8.2 Development of Remedial Action Options

The following source control RAOs were developed based on the conceptual model and the results of the remedial action technology identification and screening process.

RAO	Source Control Technologies
1	Excavation, Off-Site Landfill Disposal
2	Excavation, Off-Site Bio-Pile Treatment
3	Excavation, Off-Site Thermal Desorption

The following groundwater control/remediation RAOs were developed based on the conceptual model and the results of the remedial action technology identification and screening process.

RAO	Groundwater Control/Remediation Technologies
1	Natural Attenuation/Groundwater Monitoring

Natural attenuation with groundwater monitoring is retained as a viable technology due to the source control technology to be implemented. This allows time for natural attenuation after source removal without implementing a costly groundwater treatment system which ultimately may be unnecessary.

If based on the results of post source-control groundwater monitoring, the residual contaminants within groundwater are not naturally attenuating, active groundwater control/remediation technologies will be evaluated.

8.3 Evaluation of Remedial Action Options

The detailed evaluation of RAOs consisted of the following:

- Providing a physical and operational description of the RAO including a preliminary list of potential permits or approvals required.
- Identifying the degree of expected performance of the RAO in relation to the technical and economic feasibility criteria specified in NR 722.07(4) including the expectation that the RAO will comply with the environmental laws and standards under NR 722.09(2).

8.3.1 Evaluation of Source Control RAOs

8.3.1.1 Excavation and Off-Site Landfill Disposal

Description

This alternative would consist of excavating soil within the soil remedial action target area to a depth of approximately 15 feet. It is estimated that approximately 4,000 tons (2,667 cubic yards) of soil would be excavated; however, field screening and laboratory confirmation soil sampling and analysis would be performed to establish the final vertical and lateral limits of the excavation. It is anticipated that the excavation would not extend deeper than 5 feet into the groundwater table. Following appropriate waste profiling and landfill approval, the excavated soil would be transported to a licensed landfill facility. Mallard Ridge Recycling and Disposal Facility (RDF) (Waste Management of Wisconsin, Inc.), Delevan, Wisconsin, is located approximately 90 miles from the site. The excavation would be backfilled with material appropriate for the site use.

Technical Feasibility

This RAO would result in the reduction in contaminant toxicity, mobility and volume at the site; however, contaminated soil would not be treated. The potential risks during construction would be associated with potential fugitive emissions during excavation. These risks can be minimized by implementing appropriate engineering controls. This RAO is generally implementable; however, WDNR approval is required to landfill (without treatment) greater than 2,000 cubic yards of contaminated soil. Since the soil is not treated, there is a potential for future liability associated with this RAO. Some landfills provide indemnification from future liability; however, this does not completely alleviate liability under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA).

Economic Feasibility

The costs would include engineering and capital construction costs for excavation and off-site landfill disposal including consulting fees. There would generally be no operation and maintenance (O&M) costs associated with this RAO.

8.3.1.2 Excavation and Off-Site Bio-Pile Treatment

Description

This alternative would consist of excavation and backfill as indicated for RAO No. 1. The excavated soil would be transported to an appropriately permitted active off-site bio-pile treatment facility. Mallard Ridge RDF also has bio-pile treatment capabilities.

Technical Feasibility

This RAO would result in the reduction in contaminant toxicity, mobility and volume at the site. In addition, the excavated soils would be remediated. The contaminants detected in soil are readily biodegradable using this method. The potential short-term risks during construction would be the same as indicated for RAO No. 1. Treatment performance monitoring would be the responsibility of the off-site facility. In addition, most facilities provide indemnification of future liability. Although, this does not completely alleviate CERCLA liability, the fact that the soil is treated instead of landfilled reduces this liability.

Economic Feasibility

The engineering and capital construction costs for excavation and off-site bio-bile treatment are estimated to be less than landfilling without treatment based on experience. There would be no O&M costs associated with this RAO.

8.3.1.3 Excavation and Thermal Desorption Off-Site

Description

This RAO would consist of excavation and backfill as indicated for RAO No. 1. The excavated soil would be treated off-site by thermal desorption. The excavated soils would be transported to an appropriately licensed facility for treatment. Following verification sampling, the treated soils would be used for backfill.

Technical Feasibility

This RAO has proven success treating petroleum impacted soil and would result in the reduction in contaminant toxicity, mobility and volume at the site. In addition, the excavated soils would be remediated. Some preprocessing (size reduction and moisture control) may be required prior to treatment.

Economic Feasibility

The engineering and capital construction costs for excavation and off-site thermal desorption treatment are estimated to be more expensive than RAO No. 1 and RAO No. 2 based on experience. There would generally be no long-term O & M costs associated with this RAO.

8.3.2 Evaluation of Groundwater Control and Remediation RAOs

8.3.2.1 Natural Attenuation

Description

This RAO would consist of allowing natural attenuation to address the limited residual groundwater impacts. This RAO would likely include implementation of groundwater use restrictions and a groundwater monitoring program. It is likely that additional monitoring wells would be required for implementation of this RAO.

Technical Feasibility

It is possible that natural attenuation will be effective in reducing residual contaminant concentrations in groundwater to NR 140 groundwater quality standards in a "reasonable period of time" following implementation of the selected source control RAO.

Economic Feasibility

If required, engineering and capital construction costs for installing additional groundwater monitoring wells on-site would likely be required.

8.4 Comparison of Remedial Action Options

The developed source control RAOs were compared according to the expected degree of performance associated with the technical and economic feasibility criteria specified in the NR 722.07 (4). The results of the source control RAO comparison indicate that RAO No. 2, Excavation and Off-Site Bio-Pile Treatment, is the preferred RAO. This is due primarily to RAO No. 2's anticipated lower cost and treatment of soils reducing contaminant toxicity and mobility.

9.0 SELECTED REMEDIAL ACTION OPTION

9.1 Selected RAO

The following RAOs were selected from the developed RAOs based on the detailed evaluation and comparison presented in Section 8.0:

- Source Control ⇨ *Excavation and Off-Site Bio-Pile Treatment*
- Groundwater Control/Remediation ⇨ *Natural Attenuation/Groundwater Monitoring*

Although it is estimated that approximately 4,000 tons (2,666 cubic yards) of impacted soil would be excavated to fulfill the source control phase of the remedial action, confirmation soil sampling, field screening and laboratory analysis would be performed to establish the final vertical and lateral limits of the excavation and verify the performance of the source control RAO.

SI results indicated that on-site groundwater is impacted with petroleum constituents at concentrations exceeding the NR 140 groundwater quality standards in the area of the former tank cavity (MW-3) and the northwestern area of the site (MW-2 and MW-5). Additionally, one (1) off-site well (MW-6) is impacted with petroleum constituents above their respective ESs. It is likely that natural attenuation will be effective in reducing residual contaminant concentrations in groundwater to NR 140 groundwater quality standards in a "reasonable period of time" following implementation of the selected source removal RAO. It is also likely that at least four (4) quarters of post-source control groundwater monitoring will be required by WDNR to demonstrate the effectiveness of natural attenuation at the site. However, a longer groundwater monitoring program and additional monitoring wells may be required. As indicated previously, if based on the results of post source-control groundwater monitoring residual groundwater contamination is not naturally attenuating, active groundwater control/remediation technologies will be evaluated.

A *Remedial Action Plan* (RAP) presenting a detailed cost comparison of the RAOs will be prepared and submitted to the Wisconsin Department of Commerce (WDCOM) for approval and to the WDNR for their records.

Documentation of the soil remedial action activities will be presented in a *Remedial Action Report* following completion of the remediation.

9.2 Preliminary Remedial Action Schedule

The preliminary schedule to implement the selected RAOs is provided below:

Remedial Action Item	Estimated Schedule
Prepare and submit RAP to WDCOM and obtain WDCOM approval of the selected RAO	September 1996
Prepare Design and Bid Specifications	September 1996

Implement Source Removal\Control RAO	September/October 1996
Implement Groundwater Remediation (Natural Attenuation)	October 1996
Prepare and Submit RAO Implementation Documentation to WDNR	December 1996

10.0 GENERAL QUALIFICATIONS

Our study was performed using the degree of care and skill ordinarily exercised under similar circumstances, by environmental consultants practicing in this or similar localities. No other warranty or guarantee, expressed or implied, is made as to the conclusions and recommendations included in this report.

The findings of this report, to the best of knowledge, are valid as of the date of this study. However, changes in the conditions of a property can occur with the passage of time, whether due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation, from the broadening of knowledge, or from other reasons. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control.

Specified information contained in this report has been obtained from publicly available sources and other secondary sources of information produced by entities other than Key Environmental Services, Inc. Although care has been taken by Key Environmental Services, Inc., in compiling this information, Key Environmental Services, Inc., disclaims any and all liability for any errors, omissions, or inaccuracies of the third parties in such information and data.

The review was conducted for Mr. Ed Francois of Francois Oil Company, Inc. This report is the property of the Mr. Ed Francois and Key Environmental Services, Inc., and cannot be used without written consent from both parties.

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11.0 REFERENCES

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United States Geological Survey, *Madison East, Wisconsin, 7.5 Minute Quadrangle (Topographic) Map 1983.*

Wisconsin Administrative Code, Chapter NR 140, *Groundwater Quality Standards.*

Wisconsin Administrative Code, Chapter NR 141, *Monitoring Well Installation Procedures.*

Wisconsin Administrative Code, Chapters NR 700, *Investigation and Remediation of Environmental Contamination.*

TABLE 1

SUMMARY OF DETECTED ANALYTES IN SOIL

COTTAGE GROVE QUICK-MART
4601 Cottage Grove Road
Madison, Wisconsin

Soil Boring I.D.	B-1	B-1	B-2	B-2	B-3	B-3	B-4N	B-4	B-4	B-5	B-5	B-6	B-6	B-7	B-7	B-8	B-8	B-9N	B-9	B-9	B-10	B-10	B-11	B-11	B-12	B-12	B-13	B-13	RCL
Sample Depth (ft bgs)	13.5-15	16-17.5	3.5-5	16-17.5	11-12.5	16-17.5	8.5-10	13.5-15	16-17.5	13.5-15	16-17.5	13.5-15	16-17.5	13.5-15	16-17.5	13.5-15	16-17.5	6-7.5	13.5-15	16-17.5	8.5-10	13.5-15	6-7.5	13.5-15	3.5-5	13.5-15	3.5-5	13.5-15	
PID (i.u.)	<1	<1	27	<1	<1	<1	NA	1142	182	680	147	40	78	<1	<1	<2	<1	NA	>2000	1209	<1	<1	<1	<1	<1	<1	<1	<1	
GRO (mg/kg)	<5.0	<5.0	8.1	<5.0	<5.0	<5.0	8.4	170	17	350	19	10	39	<5.0	<5.0	<5.0	<5.0	8.2	210	450	<5.3	<5.4	<5.2	<6.0	<5.5	<5.6	<6.6	<5.6	
DRO (mg/kg)	<5.0	<5.0	NA	NA	<5.0	<5.0	<5.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<5.6	140	47	<5.3	<5.4	<5.2	<6.0	<5.5	<5.6	<6.6	<5.6	100
Ethylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	61	310	81	510	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	100	1,700	600	<3.5	<3.5	<3.5	78	<3.5	<3.5	<3.5	<3.5	100
Isopropylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<3.5	140	21	130	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<3.5	460	110	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	2,900
Methylene Chloride*	58	<50.0	<50.0	<50.0	67	58	<34	<1000	<50.0	150	64	59	<50.0	<50.0	<50.0	<50.0	<50.0	<34	<1000	150	<34	<34	<34	<34	<34	<34	<34	<34	
Naphthalene	<5.0	<5.0	27	<5.0	<5.0	<5.0	140	800	71	150	5.9	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	40	1,200	450	<7.4	<7.4	<7.4	85	<7.4	<7.4	<7.4	<7.4	
n-Butylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	270	<100	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	170	<100	<5.0	<9.6	<9.6	<9.6	61	<9.6	<9.6	<9.6	<9.6	
n-Propylbenzene	<5.0	<5.0	6	<5.0	<5.0	<5.0	74	630	76	560	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	67	1,800	400	<8.4	<8.4	<8.4	39	<8.4	<8.4	<8.4	<8.4	
p-Isopropyltoluene	<5.0	<5.0	15	<5.0	<5.0	<5.0	<9.8	450	34	400	5.7	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<9.8	870	130	<9.8	<9.8	<9.8	<9.8	<9.8	<9.8	<9.8	<9.8	
sec-Butylbenzene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<8.0	230	20	270	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<8.0	310	62	<8.0	<8.0	<8.0	<8.0	<8.0	<8.0	<8.0	<8.0	
Toluene	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<3.4	<100	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<3.4	320	88	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	1,500
Xylenes (total)	<15.0	<15.0	100	<15.0	<15.0	<15.0	220	1,700	340	110	<15.0	<15.0	<15.0	<15.0	<15.0	<15.0	<15.0	490	6,800	2,700	<6.6	<6.6	<6.6	230	<6.6	<6.6	<6.6	<6.6	4100
1,2,4-TMB	<5.0	<5.0	120	<5.0	<5.0	<5.0	460	3,800	370	2,500	19	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	530	10,000	2,200	<5.0	<5.0	<5.0	190	<5.0	<5.0	<5.0	<5.0	
1,3,5-TMB	<5.0	<5.0	100	<5.0	<5.0	<5.0	150	1,200	120	930	5.4	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	170	3,300	690	<6.2	<6.2	<6.2	36	<6.2	<6.2	<6.2	<6.2	
Lead (mg/kg)	NA	<4.0	NA	<4.0	NA	<4.0	2.9	5.2	NA	5.2	NA	NA	<4.0	<4.0	NA	<4.0	NA	3.2	5.1	NA	12	8.1	9.4	1.9	5.4	5.5	11	3.2	500

Notes:
All values are in ug/kg unless otherwise noted.
RCLs are from Chapter NR 720 of the Wisconsin Administrative Code
Bold values indicate exceedances of RCLs.
*Methylene chloride was listed by the laboratory as a common laboratory contaminant.

1,2,4-TMB - 1,2,4 - Trimethylbenzene
1,3,5-TMB - 1,3,5 - Trimethylbenzene
DRO - diesel range organics
GRO - gasoline range organics
I.D. - Indentification
NA - not analyzed
PID - Photoionization detector
RCL - Residual Contaminant Level
bgs - below ground surface
ft - feet
i.u. - instrument units
mg/kg - milligrams/kilogram
ug/kg - microgram/kilogram

TABLE 2

GROUNDWATER ELEVATIONS

COTTAGE GROVE QUICK MART
4601 Cottage Grove Road
Madison, Wisconsin

	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation
	02-22-96		07-15-96		08-12-96	
MW-1						
GS 882.53	12.27	869.71	10.23	871.75	10.42	871.56
TOC 881.98						
MW-2						
GS 882.35	12.68	869.53	11.06	871.15	11.22	870.99
TOC 882.21						
MW-3						
GS 882.92	13.36	869.44	11.91	870.89	12.02	870.78
TOC 882.80						
MW-4						
GS 883.52	13.32	869.73	11.39	871.66	11.58	871.47
TOC 883.05						
MW-5						
GS 882.10	NI		NI		10.79	870.92
TOC 881.71	NI		NI			
MW-6						
GS 881.51	NI		NI		10.76	870.35
TOC 881.11	NI		NI			

Notes:
GS - Ground Surface.
NI - Not installed
TOC - Top of PVC well casing.

TABLE 3

SUMMARY OF DETECTED ANALYTES IN GROUNDWATER

COTTAGE GROVE QUICK-MART

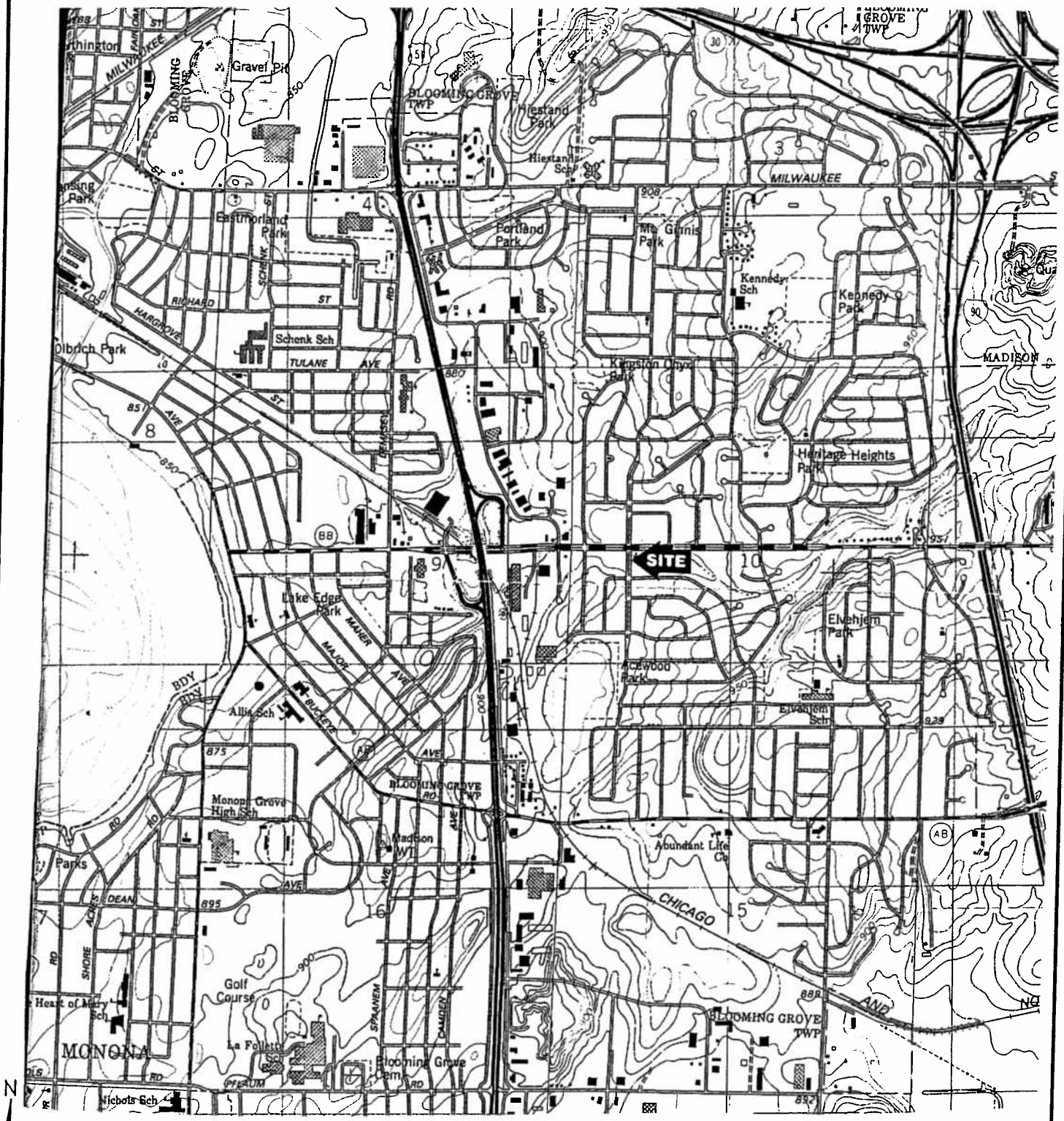
4601 Cottage Grove Road

Madison, Wisconsin

	MW-1		MW-2		MW-3		MW-4		MW-5	MW-6	PAL	ES
	02/22/96	08/12/96	02/22/96	08/12/96	02/22/96	08/12/96	02/22/96	08/12/96	08/12/96	08/12/96		
Benzene	<0.50	<0.50	**21**	**28**	**180**	**1,500**	<0.50	<0.50	<5.0	**33**	0.5	5
n-Butylbenzene	<1.0	NA	290	NA	400	NA	<1.0	NA	<5.0	82	---	---
Ethylbenzene	<1.0	<0.50	82	150	**2,200**	**1,700**	<1.0	<0.50	<5.0	320	140	700
Isopropylbenzene	<1.0	NA	40	NA	110	NA	<1.0	NA	<5.0	36	---	---
p-Isopropyltoluene	<1.0	NA	15	NA	<50	NA	<1.0	NA	<5.0	<10	---	---
Naphthalene	<1.0	NA	**66**	NA	**820**	NA	<1.0	NA	<8.0	**170**	8	40
n-propylbenzene	<1.0	NA	110	NA	360	NA	<1.0	NA	<5.0	110	---	---
Toluene	<1.0	<0.50	21	42	**2,300**	**1,500**	<1.0	<0.50	<5.0	<10	68.6	343
1,2,4-TMB	<1.0	<1.0	480	800	2,400	3,200	<1.0	<1.0	<10	650	---	---
1,3,5-TMB	<1.0	<1.0	150	110	770	940	<1.0	<1.0	<10	62	---	---
Xylene (total)	<3.0	<0.50	160	280	**8,700**	**10,000**	<3.0	<0.50	<5.0	**710**	124	620
MTBE	<1.0	<5.0	49	<250	**530**	**1,400**	<1.0	<5.0	**340**	<100	12	60
DRO (mg/l)	<0.10	NA	3.2	3.2	11	8.8	<0.10	NA	<0.10	1.6	---	---
GRO (ug/l)	<5.0	<50	3,900	11,000	27,000	41,000	<50	<50	<50	7,000	---	---
sec-Butylbenzene	<1.0	NA	<10	<10	<50	<50	<1.0	NA	<5.0	15	---	---

Notes:
All values are in ug/l unless otherwise noted.
PALs and ESs are from Chapter NR 140 of the WAC.
Bold values are concentrations that exceed the ES.

1,2,4-TMB - 1,2,4 - Trimethylbenzene
1,3,5-TMB - 1,3,5 - Trimethylbenzene
DRO - Diesel Range Organics
ES - Enforcement Standard
GRO - Gasoline Range Organics
MTBE - Methyl-tert-butyl-ether
NA - not analyzed
PAL - Preventive Action Limit
WAC - Wisconsin Administrative Code
ug/l - micrograms per liter
mg/l - milligrams per liter



SOURCE: *USGS Madison East Quadrangle*
Topographic Map 1983

DATE	REVISIONS	INI.

0 1000 2000

SCALE: 1"=2000'

FIGURE 1
SITE LOCATION MAP

CITGO QUICK MART
4601 COTTAGE GROVE ROAD
MADISON, WISCONSIN 53716

DRN. BY:	A.L.R.	DATE:	02/01/96
DSN. BY:	V.S.V.	FILE NO.:	0511021
CHK. BY:	V.S.V.	DWG. NO.:	05110211
REV. BY:	G.L.J.	SHEET NO.:	1

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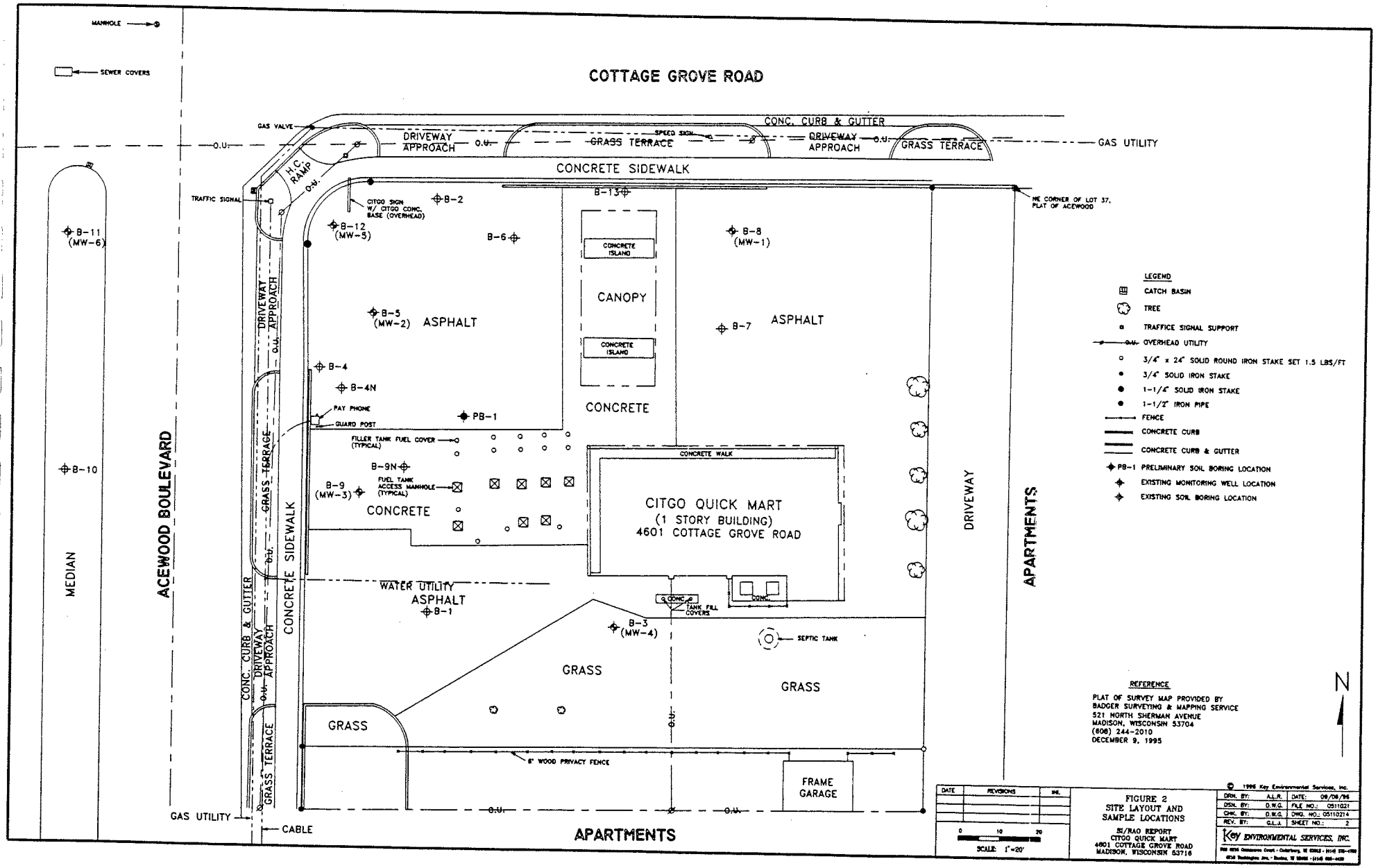
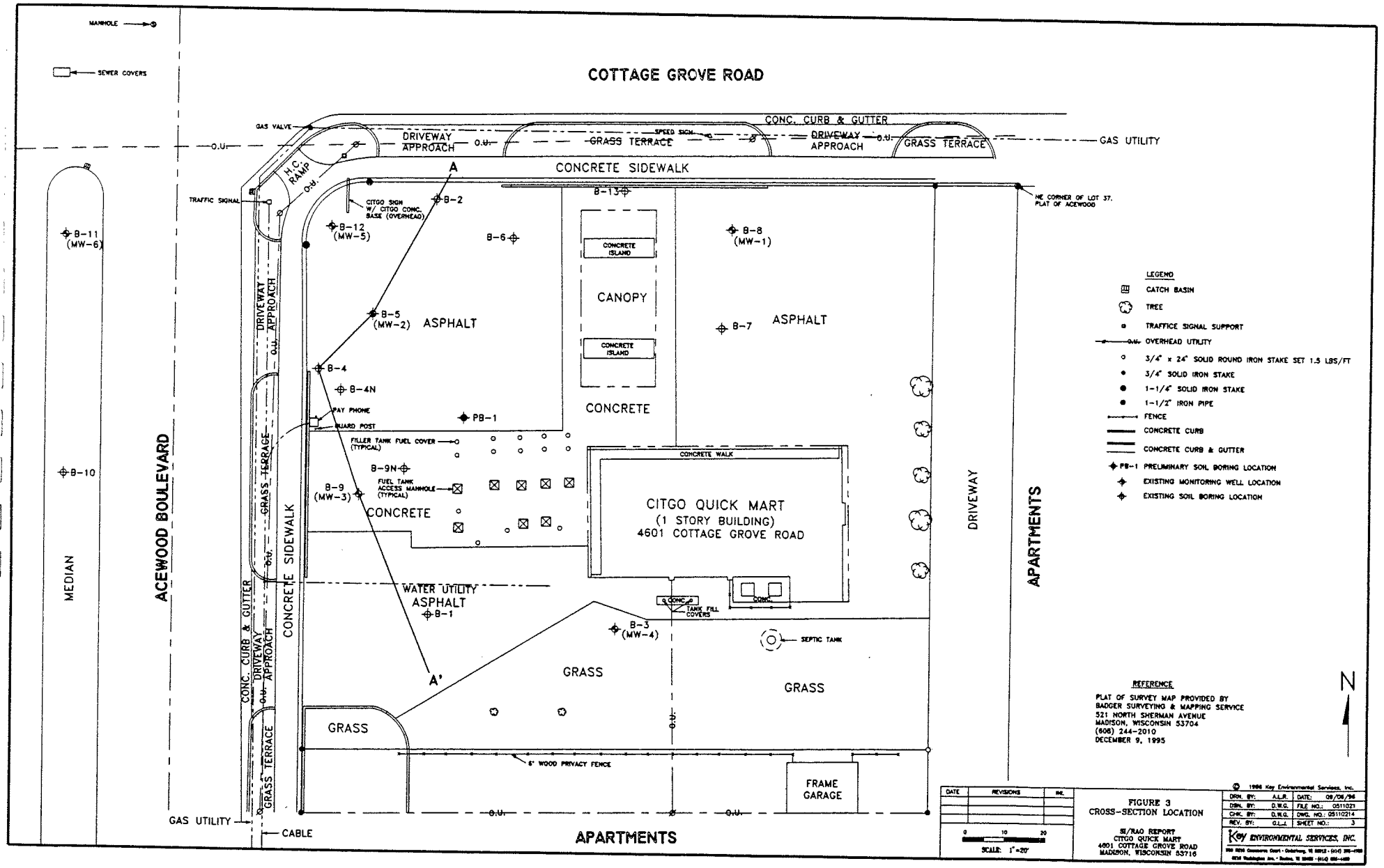
6216 Washington Ave. • Racine, WI 53406 • (414) 886-4439


COTTAGE GROVE ROAD
MANHOLE
SEWER COVERS
GAS VALVE
O.U.
DRIVEWAY APPROACH
GRASS TERRACE
SPEED SIGN
CONC. CURB & GUTTER
DRIVEWAY APPROACH
GRASS TERRACE
GAS UTILITY
CONCRETE SIDEWALK
H.C. RAMP
TRAFFIC SIGNAL
CITGO SIGN W/ CITGO CONC. BASE (OVERHEAD)
B-2
B-13
NE CORNER OF LOT 37, PLAT OF ACEWOOD
B-12 (MW-5)
B-6
B-8 (MW-1)
B-11 (MW-6)
CONCRETE ISLAND
CANOPY
CONCRETE ISLAND
B-5 (MW-2)
ASPHALT
B-7
ASPHALT
B-4
B-4N
PAY PHONE
GUARD POST
PB-1
CONCRETE
FILLER TANK FUEL COVER (TYPICAL)
CONCRETE WALK
B-9N
B-9 (MW-3)
FUEL TANK ACCESS MANHOLE (TYPICAL)
CONCRETE
CITGO QUICK MART
(1 STORY BUILDING)
4601 COTTAGE GROVE ROAD
B-10
MEDIAN
ACEWOOD BOULEVARD
DRIVEWAY APPROACH
GRASS TERRACE
CONCRETE SIDEWALK
DRIVEWAY
APARTMENTS
WATER UTILITY
ASPHALT
B-1
CONC.
TANK FILL COVERS
B-3 (MW-4)
SEPTIC TANK
CONC. CURB & GUTTER
DRIVEWAY APPROACH
GRASS TERRACE
GRASS
GRASS
GRASS
6' WOOD PRIVACY FENCE
FRAME GARAGE
GAS UTILITY
CABLE
APARTMENTS
LEGEND
CATCH BASIN
TREE
TRAFFICE SIGNAL SUPPORT
O.U. OVERHEAD UTILITY
3/4" x 24" SOLID ROUND IRON STAKE SET 1.5 LBS/FT
3/4" SOLID IRON STAKE
1-1/4" SOLID IRON STAKE
1-1/2" IRON PIPE
FENCE
CONCRETE CURB
CONCRETE CURB & GUTTER
PB-1 PRELIMINARY SOIL BORING LOCATION
EXISTING MONITORING WELL LOCATION
EXISTING SOIL BORING LOCATION
REFERENCE
PLAT OF SURVEY MAP PROVIDED BY
BADGER SURVEYING & MAPPING SERVICE
521 NORTH SHERMAN AVENUE
MADISON, WISCONSIN 53704
(608) 244-2010
DECEMBER 9, 1995
N
DATE
REVISIONS
INI.
0 10 20
SCALE: 1"=20'
FIGURE 2
SITE LAYOUT AND
SAMPLE LOCATIONS
SI/RAO REPORT
CITGO QUICK MART
4601 COTTAGE GROVE ROAD
MADISON, WISCONSIN 53716
© 1996 Key Environmental Services, Inc.
DRN. BY: A.L.R. DATE: 09/06/96
DSN. BY: D.W.G. FILE NO.: 0511021
CHK. BY: D.W.G. DWG. NO.: 05110214
REV. BY: G.L.J. SHEET NO.: 2
Key ENVIRONMENTAL SERVICES, INC.



REFERENCE

PLAT OF SURVEY MAP PROVIDED BY
BADGER SURVEYING & MAPPING SERVICE
521 NORTH SHERMAN AVENUE
MADISON, WISCONSIN 53704
(608) 244-2010
DECEMBER 9, 1995

DATE	REVISIONS	INI.

FIGURE 3
CROSS-SECTION LOCATION

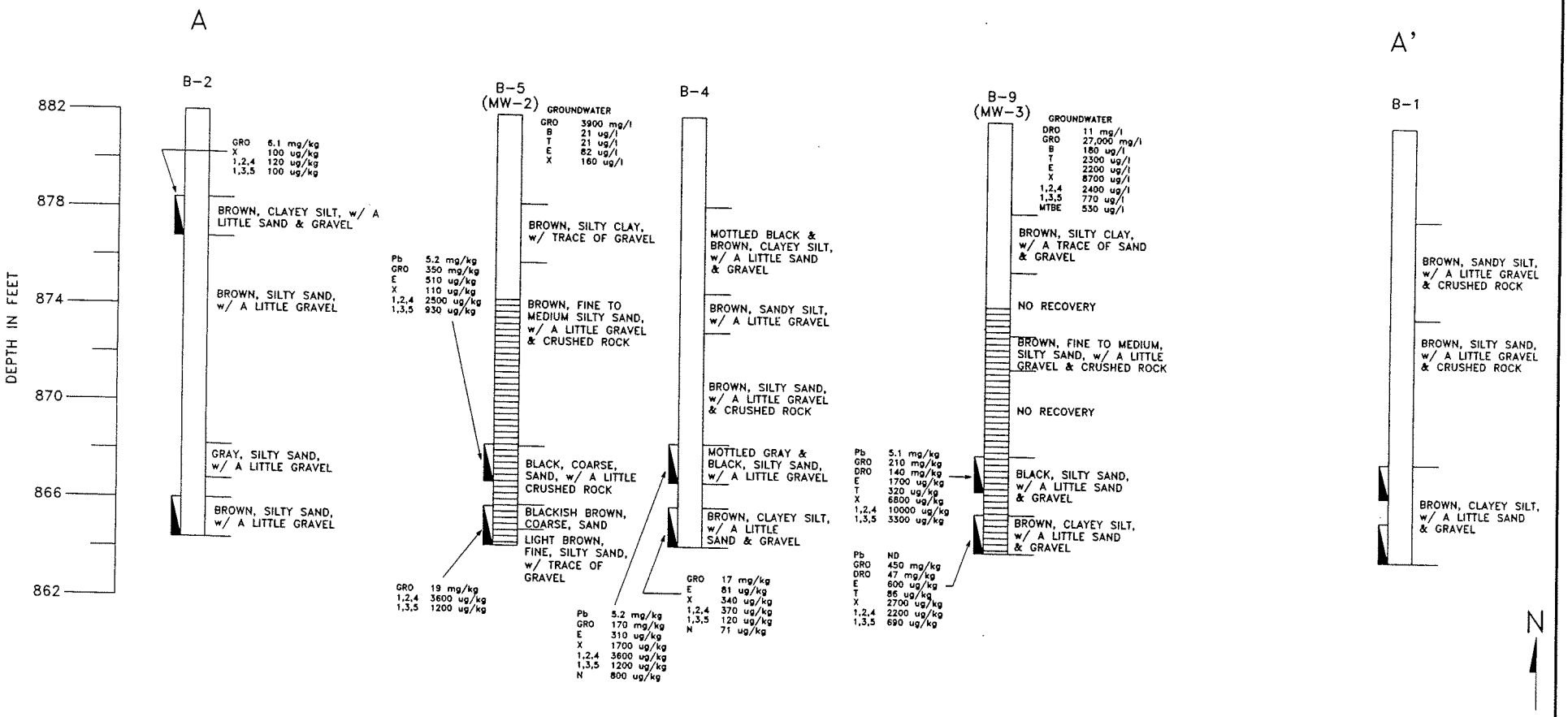
SI/RAO REPORT
CITGO QUICK MART
4601 COTTAGE GROVE ROAD
MADISON, WISCONSIN 53716

DRN. BY:	A.L.R.	DATE:	08/06/96
DSN. BY:	D.W.G.	FILE NO.:	0511023
CHK. BY:	D.W.G.	DWG. NO.:	05110214
REV. BY:	D.L.J.	SHEET NO.:	3

Key ENVIRONMENTAL SERVICES, INC.

SCHEMATIC CROSS-SECTION A-A'

CITGO QUICK MART
4601 COTTAGE GROVE ROAD
MADISON, WISCONSIN



NOTES

Pb	TOTAL LEAD, mg/kg
GRO	GASOLINE RANGE ORGANICS, mg/kg
E	ETHYLBENZENE, ug/kg
N	NAPHTHALENE, ug/kg
1,2,4	1,2,4-TRIMETHYLBENZENE, ug/kg
X	TOTAL XYLENES, ug/kg
MC	METHYLENE CHLORIDE, ug/kg

LEGEND

SCREENED INTERVAL

DATE	REVISIONS	INI.

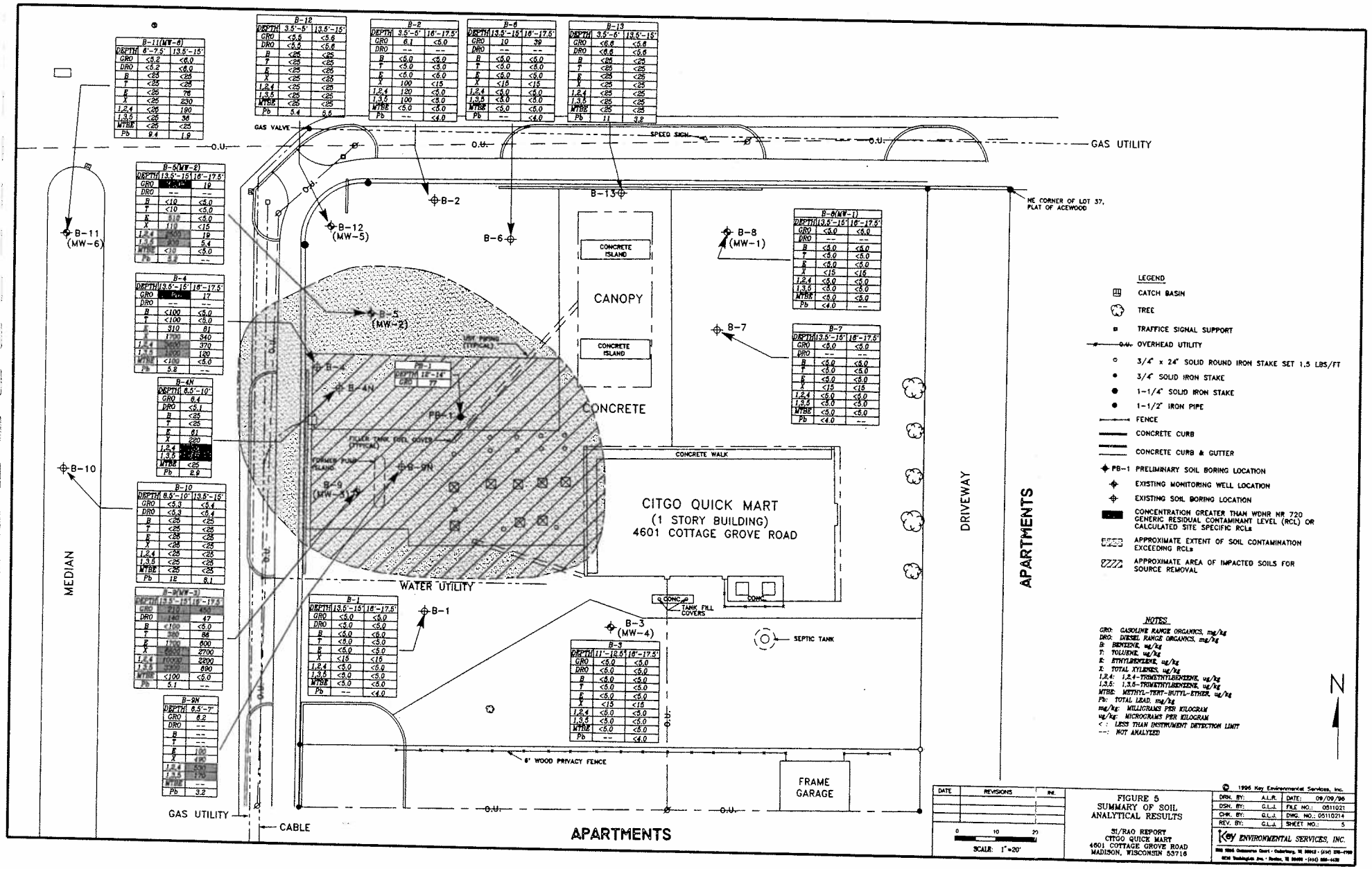
HORIZONTAL SCALE: 1"=10'
VERTICAL SCALE: 1"=4'

FIGURE 4
SCHEMATIC CROSS-SECTION A-A'

SI/RAO REPORT
CITGO QUICK MART
4601 COTTAGE GROVE ROAD
MADISON, WISCONSIN 53716

DRN. BY:	A.L.R.	DATE:	09/06/96
DSN. BY:	D.W.G.	FILE NO.:	0511021
CHK. BY:	G.L.J.	DWG. NO.:	05110216
REV. BY:	V.S.V.	SHEET NO.:	4

Key ENVIRONMENTAL SERVICES, INC.
W66 N215 Commerce Court · Cedarburg, WI 53012 · (414) 375-4750
6216 Washington Ave. · Racine, WI 53406 · (414) 886-4439



B-11(MW-6)

DEPTH	6'-7.5'	13.5'-15'
GRO	<5.2	<6.0
DRO	<5.2	<6.0
B	<25	<25
T	<25	<25
E	<25	76
X	<25	230
1,2,4	<25	190
1,3,5	<25	56
MTBE	<25	<25
Pb	9.4	1.9

B-12

DEPTH	3.5'-5'	13.5'-15'
GRO	<5.5	<5.6
DRO	<5.5	<5.6
B	<25	<25
T	<25	<25
E	<25	<25
X	<25	<25
1,2,4	<25	<25
1,3,5	<25	<25
MTBE	<25	<25
Pb	5.4	5.6

B-2

DEPTH	3.5'-5'	16'-17.5'
GRO	6.1	<5.0
DRO	--	--
B	<5.0	<5.0
T	<5.0	<5.0
E	<5.0	<5.0
X	100	<15
1,2,4	120	<5.0
1,3,5	100	<5.0
MTBE	<5.0	<5.0
Pb	--	<4.0

B-6

DEPTH	13.5'-15'	16'-17.5'
GRO	10	39
DRO	--	--
B	<5.0	<5.0
T	<5.0	<5.0
E	<5.0	<5.0
X	<15	<15
1,2,4	<5.0	<5.0
1,3,5	<5.0	<5.0
MTBE	<5.0	<5.0
Pb	--	<4.0

B-13

DEPTH	3.5'-5'	13.5'-15'
GRO	<5.6	<5.8
DRO	<5.6	<5.8
B	<25	<25
T	<25	<25
E	<25	<25
X	<25	<25
1,2,4	<25	<25
1,3,5	<25	<25
MTBE	<25	<25
Pb	11	3.2

B-6(MW-2)

DEPTH	13.5'-15'	16'-17.5'
GRO	[redacted]	19
DRO	--	--
B	<10	<5.0
T	<10	<5.0
E	810	<5.0
X	110	<15
1,2,4	[redacted]	19
1,3,5	[redacted]	5.4
MTBE	<10	<5.0
Pb	5.8	--

B-4

DEPTH	13.5'-15'	16'-17.5'
GRO	[redacted]	17
DRO	--	--
B	<100	<5.0
T	<100	<5.0
E	310	81
X	1700	340
1,2,4	[redacted]	370
1,3,5	[redacted]	120
MTBE	<100	<5.0
Pb	5.8	--

B-4N

DEPTH	6.5'-10'
GRO	6.4
DRO	<5.1
B	<25
T	<25
E	61
X	220
1,2,4	[redacted]
1,3,5	[redacted]
MTBE	<25
Pb	2.9

B-10

DEPTH	6.5'-10'	13.5'-15'
GRO	<5.3	<5.4
DRO	<5.3	<5.4
B	<25	<25
T	<25	<25
E	<25	<25
X	<25	<25
1,2,4	<25	<25
1,3,5	<25	<25
MTBE	<25	<25
Pb	12	8.1

B-9(MW-9)

DEPTH	13.5'-15'	16'-17.5'
GRO	[redacted]	450
DRO	[redacted]	47
B	<100	<5.0
T	[redacted]	86
E	[redacted]	800
X	[redacted]	2700
1,2,4	[redacted]	2200
1,3,5	[redacted]	690
MTBE	<100	<5.0
Pb	5.1	--

B-9N

DEPTH	6.5'-7'
GRO	6.2
DRO	--
B	--
T	--
E	100
X	390
1,2,4	530
1,3,5	170
MTBE	--
Pb	3.2

B-1

DEPTH	13.5'-15'	16'-17.5'
GRO	<5.0	<5.0
DRO	<5.0	<5.0
B	<5.0	<5.0
T	<5.0	<5.0
E	<5.0	<5.0
X	<15	<15
1,2,4	<5.0	<5.0
1,3,5	<5.0	<5.0
MTBE	<5.0	<5.0
Pb	--	<4.0

B-3

DEPTH	11'-12.5'	16'-17.5'
GRO	<5.0	<5.0
DRO	<5.0	<5.0
B	<5.0	<5.0
T	<5.0	<5.0
E	<5.0	<5.0
X	<15	<15
1,2,4	<5.0	<5.0
1,3,5	<5.0	<5.0
MTBE	<5.0	<5.0
Pb	--	<4.0

B-8(MW-1)

DEPTH	13.5'-15'	16'-17.5'
GRO	<5.0	<5.0
DRO	--	--
B	<5.0	<5.0
T	<5.0	<5.0
E	<5.0	<5.0
X	<15	<15
1,2,4	<5.0	<5.0
1,3,5	<5.0	<5.0
MTBE	<5.0	<5.0
Pb	<4.0	--

B-7

DEPTH	13.5'-15'	16'-17.5'
GRO	<5.0	<5.0
DRO	--	--
B	<5.0	<5.0
T	<5.0	<5.0
E	<5.0	<5.0
X	<15	<15
1,2,4	<5.0	<5.0
1,3,5	<5.0	<5.0
MTBE	<5.0	<5.0
Pb	<4.0	--

LEGEND

- CATCH BASIN
- TREE
- TRAFFICE SIGNAL SUPPORT
- O.U. OVERHEAD UTILITY
- 3/4" x 24" SOLID ROUND IRON STAKE SET 1.5 LBS/FT
- 3/4" SOLID IRON STAKE
- 1-1/4" SOLID IRON STAKE
- 1-1/2" IRON PIPE
- FENCE
- CONCRETE CURB
- CONCRETE CURB & GUTTER
- PB-1 PRELIMINARY SOIL BORING LOCATION
- EXISTING MONITORING WELL LOCATION
- EXISTING SOIL BORING LOCATION
- CONCENTRATION GREATER THAN WDNR NR 720 GENERIC RESIDUAL CONTAMINANT LEVEL (RCL) OR CALCULATED SITE SPECIFIC RCLs
- APPROXIMATE EXTENT OF SOIL CONTAMINATION EXCEEDING RCLs
- APPROXIMATE AREA OF IMPACTED SOILS FOR SOURCE REMOVAL

NOTES

GRO: GASOLINE RANGE ORGANICS, mg/kg
DRO: DIESEL RANGE ORGANICS, mg/kg
B: BENZENE, ug/kg
T: TOLUENE, ug/kg
E: ETHYLBENZENE, ug/kg
X: TOTAL XYLENES, ug/kg
1,2,4: 1,2,4-TRIMETHYLBENZENE, ug/kg
1,3,5: 1,3,5-TRIMETHYLBENZENE, ug/kg
MTBE: METHYL-TERT-BUTYL-ETHER, ug/kg
Pb: TOTAL LEAD, mg/kg
mg/kg: MILLIGRAMS PER KILOGRAM
ug/kg: MICROGRAMS PER KILOGRAM
< : LESS THAN INSTRUMENT DETECTION LIMIT
--: NOT ANALYZED

DATE	REVISIONS	INI.

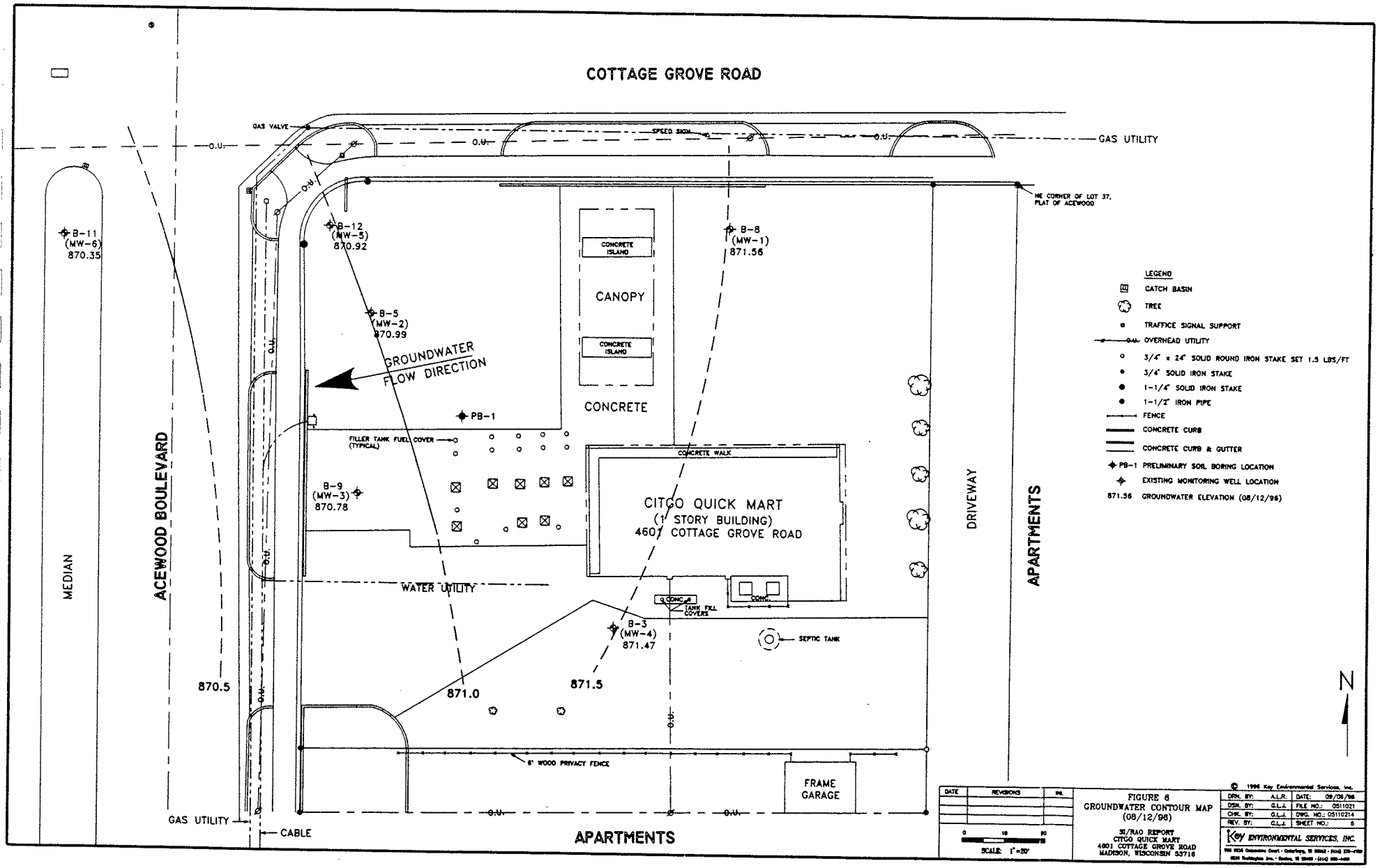
SCALE: 1" = 20'

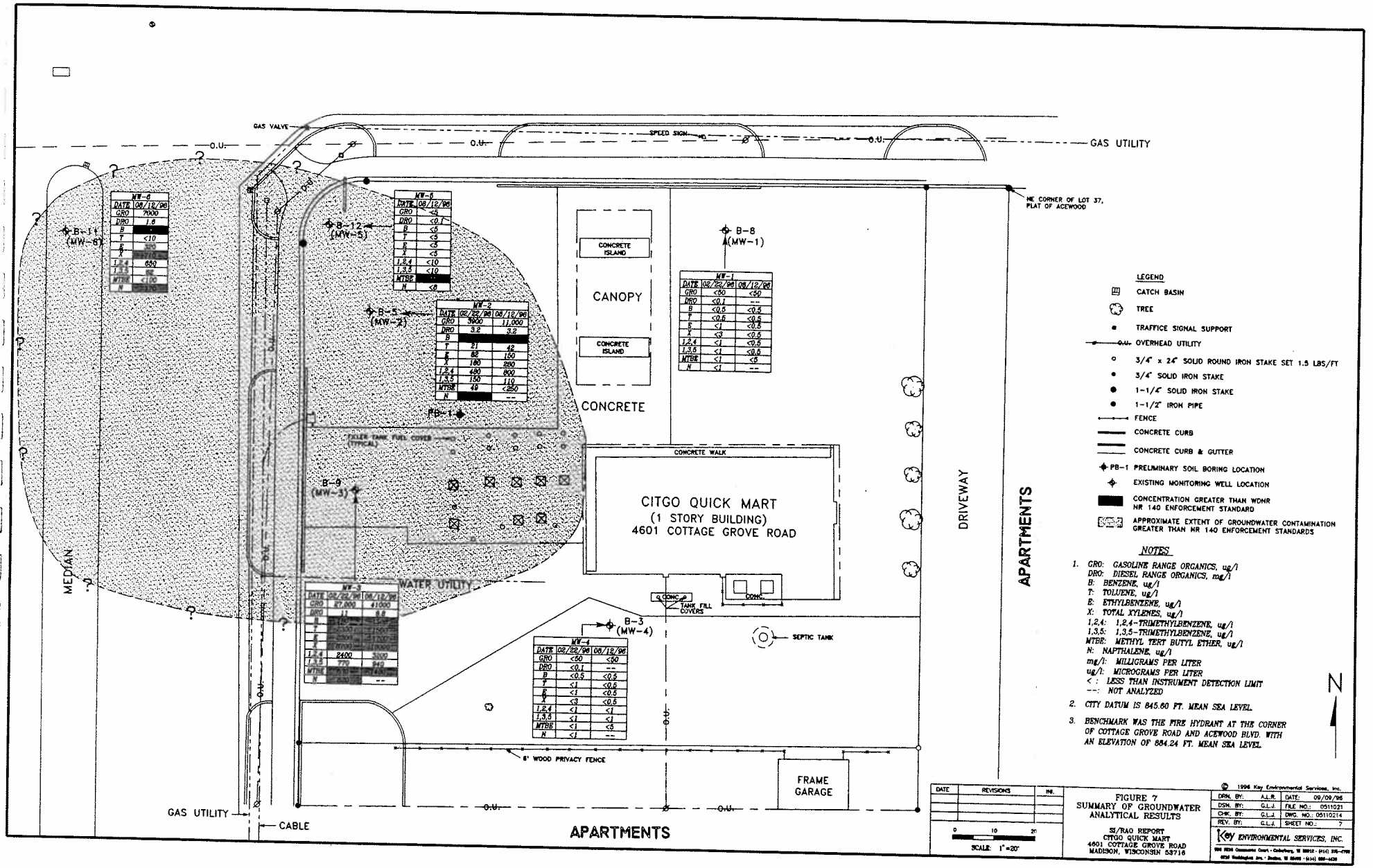
FIGURE 5
SUMMARY OF SOIL ANALYTICAL RESULTS

SI/RAO REPORT
CITGO QUICK MART
4601 COTTAGE GROVE ROAD
MADISON, WISCONSIN 53716

DRN. BY:	A.L.R.	DATE:	09/09/96
DSN. BY:	G.L.J.	FILE NO.:	0511021
CHK. BY:	G.L.J.	DWG. NO.:	05110214
REV. BY:	G.L.J.	SHEET NO.:	5

Key ENVIRONMENTAL SERVICES, INC.


COTTAGE GROVE ROAD
GAS VALVE
SPEED SIGN
O.U.
GAS UTILITY
NE CORNER OF LOT 37, PLAT OF ACEWOOD
B-11 (MW-6) 870.35
B-12 (MW-5) 870.92
B-8 (MW-1) 871.56
B-5 (MW-2) 870.99
CONCRETE ISLAND
CANOPY
CONCRETE ISLAND
GROUNDWATER FLOW DIRECTION
CONCRETE
PB-1
FILLER TANK FUEL COVER (TYPICAL)
CONCRETE WALK
B-9 (MW-3) 870.78
CITGO QUICK MART
(1 STORY BUILDING)
4601 COTTAGE GROVE ROAD
DRIVEWAY
APARTMENTS
MEDIAN
ACEWOOD BOULEVARD
WATER UTILITY
CONC.
CONC.
TANK FILL COVERS
B-3 (MW-4) 871.47
SEPTIC TANK
870.5
871.0
871.5
6' WOOD PRIVACY FENCE
FRAME GARAGE
GAS UTILITY
CABLE
APARTMENTS
LEGEND
CATCH BASIN
TREE
TRAFFICE SIGNAL SUPPORT
OVERHEAD UTILITY
3/4" x 24" SOLID ROUND IRON STAKE SET 1.5 LBS/FT
3/4" SOLID IRON STAKE
1-1/4" SOLID IRON STAKE
1-1/2" IRON PIPE
FENCE
CONCRETE CURB
CONCRETE CURB & GUTTER
PB-1 PRELIMINARY SOIL BORING LOCATION
EXISTING MONITORING WELL LOCATION
871.56 GROUNDWATER ELEVATION (08/12/96)
N
DATE
REVISIONS
INI.
0
10
20
SCALE: 1" = 20'
FIGURE 6
GROUNDWATER CONTOUR MAP
(08/12/96)
SI/RAO REPORT
CITGO QUICK MART
4601 COTTAGE GROVE ROAD
MADISON, WISCONSIN 53716
© 1996 Key Environmental Services, Inc.
DRN. BY: A.L.R.
DATE: 09/06/96
DSN. BY: G.L.J.
FILE NO.: 0511021
CHK. BY: G.L.J.
DWG. NO.: 05110214
REV. BY: G.L.J.
SHEET NO.: 6
Key ENVIRONMENTAL SERVICES, INC.



MW-4	
DATE	08/12/96
GRO	7000
DRO	1.6
B	[redacted]
T	<10
E	320
X	[redacted]
1,2,4	680
1,3,5	190
MTBE	<100
N	[redacted]

MW-6	
DATE	08/12/96
GRO	<5
DRO	<0.1
B	<5
T	<5
E	<5
X	<5
1,2,4	<10
1,3,5	<10
MTBE	[redacted]
N	<8

MW-2		
DATE	02/22/96	08/12/96
GRO	5900	11,000
DRO	3.2	3.2
B	[redacted]	
T	81	42
E	82	150
X	180	280
1,2,4	490	800
1,3,5	150	110
MTBE	49	<250
N	[redacted]	---

MW-1		
DATE	02/22/96	08/12/96
GRO	<50	<50
DRO	<0.1	---
B	<0.5	<0.5
T	<0.5	<0.5
E	<1	<0.5
X	<3	<0.5
1,2,4	<1	<0.5
1,3,5	<1	<0.5
MTBE	<1	<5
N	<1	---

MW-3		
DATE	02/22/96	08/12/96
GRO	87,000	41000
DRO	13	8.6
B	[redacted]	[redacted]
T	[redacted]	[redacted]
E	[redacted]	[redacted]
X	[redacted]	[redacted]
1,2,4	2400	3000
1,3,5	770	910
MTBE	[redacted]	[redacted]
N	[redacted]	---

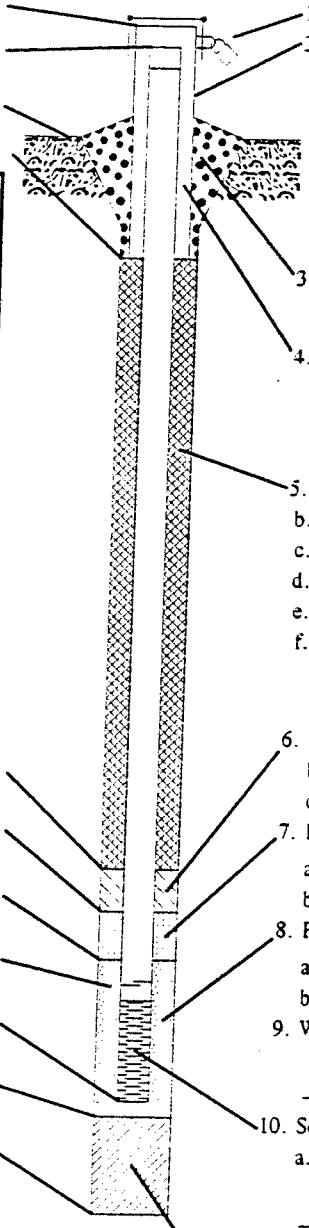
MW-4		
DATE	02/22/96	08/12/96
GRO	<50	<50
DRO	<0.1	---
B	<0.5	<0.5
T	<1	<0.5
E	<1	<0.5
X	<3	<0.5
1,2,4	<1	<1
1,3,5	<1	<1
MTBE	<1	<5
N	<1	---

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Cottage Grove Citgo Quick Mart	Local Grid Location of Well: ☐ N. _____ ft. ☐ S. ☐ E. _____ ft. ☐ W.	Well Name: MW-4
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ° ' " Long. ° ' " or St. Plane _____ ft. N. _____ ft. E.	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☒ 11; Piezometer ☐ 12	Section Location of Waste/Source: NW 1/4 of NW 1/4 of Sec. 10 T. 7 N. R. 10 ☐ E. ☐ W.	Date Well Installed: 02/16/96
Distance Well Is From Waste/Source Boundary: ft.	Location of Well Relative to Waste/Source: u ☒ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm): Zov Begos; Key Environmental
Is Well A Point of Enforcement Std. Application? ☒ Yes ☐ No		



A. Protective pipe, top elevation _____ ft. MSL
B. Well casing, top elevation _____ ft. MSL
C. Land surface elevation _____ ft. MSL
D. Surface seal, bottom _____ ft. MSL or 1.0 ft.

12. USC classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☒ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; _____ Other ☐

15. Drilling fluid used: Water ☐ 02 Air ☐ 01; Drilling Mud ☐ 03 None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe N/A

17. Source of water (attach analysis):
N/A

E. Bentonite seal, top _____ ft. MSL or 1.0 ft.
F. Fine sand, top _____ ft. MSL or 5.5 ft.
G. Filter pack, top _____ ft. MSL or 6.5 ft.
H. Screen joint, top _____ ft. MSL or 7.5 ft.
I. Well bottom _____ ft. MSL or 17.5 ft.
J. Filter pack, bottom _____ ft. MSL or 17.5 ft.
K. Borehole, bottom _____ ft. MSL or 17.5 ft.
L. Borehole, diameter 8 1/4 in.
M. O.D. well casing 2.30 in.
N. I.D. well casing 2.00 in.

1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 8.0 in.
b. Length: 1.0 ft.
c. Material: Steel ☒ 04; _____ Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: _____
3. Surface seal: Bentonite ☐ 30; Concrete ☒ 01; _____ Other ☐
4. Material between well casing and protective pipe: Bentonite ☒ 30; Annular space seal ☐; _____ Other ☐
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight . . Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight . . . Bentonite slurry ☐ 31
d. _____ % Bentonite . . . Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite pellets ☒ 32
c. _____ Other ☐
7. Fine sand material: Manufacturer, product name and mesh size
a. Red Flint #35-45
b. Volume added 1/2 bag ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint #30
b. Volume added 4 bags ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; _____ Other ☐
10. Screen material: PVC
a. Screen Type: Factory cut ☒ 11; Continuous slot ☐ 01; _____ Other ☐
b. Manufacturer Cooks Environmental
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☒ 14; _____ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Zov Begos
Firm: KEY ENVIRONMENTAL SERVICES, INC.
W66 N215 Commerce Court Cedarburg, WI 53012
Tel: (414) 375-4750
Fax: (414) 375-9680

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION

Form 4400-113A Rev. 4-90

Facility/Project Name: Cottage Grove Citgo Quick Mart	Local Grid Location of Well: ☐ N. ☐ S. _____ ft. ☐ E. ☐ W. _____ ft.	Well Name: MW-5
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ° ' " Long. ° ' " or	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☒ 11; Piezometer ☐ 12	St. Plane _____ ft. N. _____ ft. E.	Date Well Installed: 07/29/96
Distance Well Is From Waste/Source Boundary: ft.	Section Location of Waste/Source: NW 1/4 of NW 1/4 of Sec. 10 T. 7 N. R. 10 ☒ E. ☐ W.	Well Installed By: (Person's Name and Firm): Zoy Begos / Key Environmental
Is Well A Point of Enforcement Std. Application? ☒ Yes ☐ No	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☒ Sidegradient d ☐ Downgradient n ☐ Not Known	

A. Protective pipe, top elevation _____ ft. MSL

B. Well casing, top elevation _____ ft. MSL

C. Land surface elevation _____ ft. MSL

D. Surface seal, bottom _____ ft. MSL or 1.0 ft.

12. USC classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☒ Yes ☐ No

14. Drilling method used: Rotary ☐ 5 0; Hollow Stem Auger ☒ 4 1; _____ Other ☐ __

15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1 Drilling Mud ☐ 0 3 None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No

Describe N/A

17. Source of water (attach analysis):
N/A

E. Bentonite seal, top _____ ft. MSL or 1.0 ft.

F. Fine sand, top _____ ft. MSL or 5.5 ft.

G. Filter pack, top _____ ft. MSL or 6.5 ft.

H. Screen joint, top _____ ft. MSL or 7.5 ft.

I. Well bottom _____ ft. MSL or 17.5 ft.

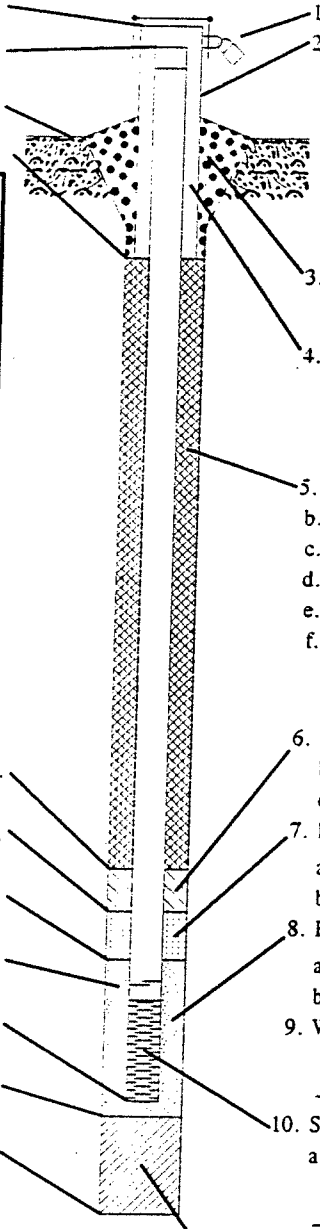
J. Filter pack, bottom _____ ft. MSL or 17.5 ft.

K. Borehole, bottom _____ ft. MSL or 17.5 ft.

L. Borehole, diameter 8 1/4 in.

M. O.D. well casing 2.30 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 8.0 in.
b. Length: 1.0 ft.
c. Material: Steel ☒ 0 4; _____ Other ☐ __
d. Additional protection? ☐ Yes ☒ No
If yes, describe: _____

3. Surface seal: Bentonite ☐ 3 0; Concrete ☒ 0 1; _____ Other ☐ __

4. Material between well casing and protective pipe:
Bentonite ☒ 3 0; Annular space seal ☐ __; _____ Other ☐ __

5. Annular space seal: a. Granular Bentonite ☐ 3 3
b. _____ Lbs/gal mud weight . . Bentonite-sand slurry ☐ 3 5
c. _____ Lbs/gal mud weight . . . Bentonite slurry ☐ 3 1
d. _____ % Bentonite . . . Bentonite-cement grout ☐ 5 0
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 0 1; Tremie pumped ☐ 0 2; Gravity ☐ 0 8

6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite pellets ☒ 3 2
c. _____ Other ☐ __

7. Fine sand material: Manufacturer, product name and mesh size
a. Red Flint #45-55 __
b. Volume added 1/2 bag ft^3

8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint #30 __
b. Volume added 4 bags ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3; Flush threaded PVC schedule 80 ☐ 2 4; _____ Other ☐ __

10. Screen material: PVC __
a. Screen Type: Factory cut ☒ 1 1; Continuous slot ☐ 0 1; _____ Other ☐ __
b. Manufacturer Dietrich
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.

11. Backfill material (below filter pack): None ☒ 1 4; _____ Other ☐ __

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Zoy Begos

Firm: KEY ENVIRONMENTAL SERVICES, INC.
W66 N215 Commerce Court Cedarburg, WI 53012
Tel: (414) 375-4750
Fax: (414) 375-9680

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State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION

Form 4400-113A Rev. 4-90

Facility/Project Name: Cottage Grove Citgo Quick Mart	Local Grid Location of Well: _____ ft. ☐N. ☐S. _____ ft. ☐E. ☐W.	Well Name: MW-6
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ° ' " Long. ° ' " or	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☒11; Piezometer ☐12	St. Plane _____ ft. N. _____ ft. E.	Date Well Installed: 07/29/96
Distance Well Is From Waste/Source Boundary: ft.	Section Location of Waste/Source: NW 1/4 of NW 1/4 of Sec. 10 T. 7 N. R. 10 ☒E. ☐W.	Well Installed By: (Person's Name and Firm): Zoy Begos; Key Environmental
Is Well A Point of Enforcement Std. Application? ☐ Yes ☒ No	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☒ Downgradient n ☐ Not Known	

A. Protective pipe, top elevation _____ ft. MSL

B. Well casing, top elevation _____ ft. MSL

C. Land surface elevation _____ ft. MSL

D. Surface seal, bottom _____ ft. MSL or 1.0 ft.

12. USC classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☒ Yes ☐ No

14. Drilling method used: Rotary ☐50; Hollow Stem Auger ☒41; _____ Other ☐

15. Drilling fluid used: Water ☐02 Air ☐01; Drilling Mud ☐03 None ☒99

16. Drilling additives used? ☐ Yes ☒ No

Describe N/A

17. Source of water (attach analysis):
N/A

E. Bentonite seal, top _____ ft. MSL or 1.0 ft.

F. Fine sand, top _____ ft. MSL or 5.5 ft.

G. Filter pack, top _____ ft. MSL or 6.5 ft.

H. Screen joint, top _____ ft. MSL or 7.5 ft.

I. Well bottom _____ ft. MSL or 17.5 ft.

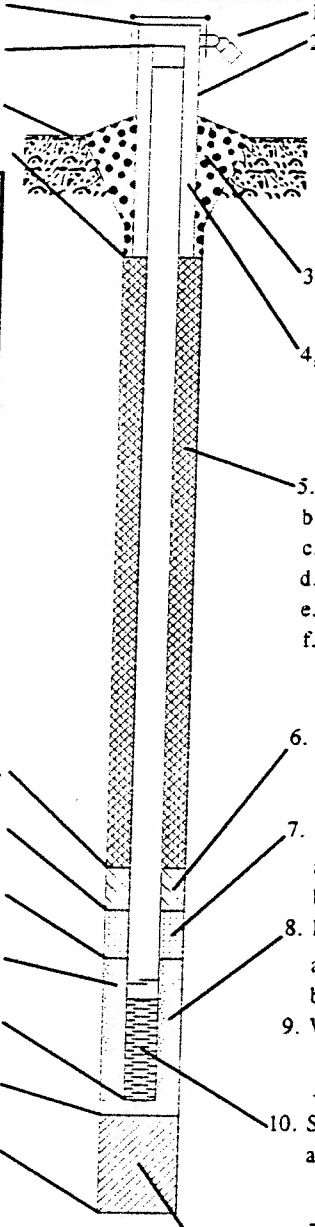
J. Filter pack, bottom _____ ft. MSL or 17.5 ft.

K. Borehole, bottom _____ ft. MSL or 17.5 ft.

L. Borehole, diameter 8 1/4 in.

M. O.D. well casing 2.30 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 8.0 in.
b. Length: 1.0 ft.
c. Material: _____ Steel ☒ 04 Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: _____

3. Surface seal: _____ Bentonite ☐ 30 Concrete ☒ 01 Other ☐

4. Material between well casing and protective pipe:
_____ Bentonite ☒ 30 Annular space seal ☐ Other ☐

5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight . . Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight . . . Bentonite slurry ☐ 31
d. _____ % Bentonite . . . Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01 Tremie pumped ☐ 02 Gravity ☐ 08

6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☒3/8 in. ☐1/2 in. Bentonite pellets ☒ 32
c. _____ Other ☐

7. Fine sand material: Manufacturer, product name and mesh size
a. Red Flint #45-55
b. Volume added 1/2 bag ft^3

8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint #30
b. Volume added 4 bags ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ 23 Flush threaded PVC schedule 80 ☐ 24 _____ Other ☐

10. Screen material: PVC
a. Screen Type: Factory cut ☒ 11 Continuous slot ☐ 01 _____ Other ☐
b. Manufacturer Dietrich
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.

11. Backfill material (below filter pack): _____ None ☒ 14 Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Zoy Begos

Firm: KEY ENVIRONMENTAL SERVICES, INC.
W66 N215 Commerce Court Cedarburg, WI 53012
Tel: (414) 375-4750
Fax: (414) 375-9680

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State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County	Well Name
Cottage Grove Citgo Quick Mart	Dane	MW-4
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
	13	

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed, and pumped	☐ 70
compressed air	☐ 20
bailed only	☒ 10
pumped only	☐ 51
pumped slowly	☐ 50
other _____	☐

3. Time spent developing well 40.0 min.

4. Depth of well (from top of well casing) 17.4 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 4.4 gal.

7. Volume of water removed from well 30.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added N/A

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing) a.	13.32 ft.	14.83 ft.
Date b.	02/22/96	02/22/96
Time c.	11:00 ☒ a.m. ☐ p.m.	11:40 ☒ a.m. ☐ p.m.
12. Sediment in well bottom	10.0 inches	inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) Light brown. silty	Clear ☐ 20 Turbid ☒ 25 (Describe) Light brown. clear
Fill in if drilling fluids were used and well is at solid waste facility:		
14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Additional comments on development:

Well developed by: Person's Name and Firm

Name: Zov Begos

Firm: Key Environmental

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Zov Begos

Print Initials: ZB

Firm: KEY ENVIRONMENTAL SERVICES, INC.

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County	Well Name
Cottage Grove Citgo Quick Mart	Dane	MW-5
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
	13	

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☒	10
pumped only	☐	51
pumped slowly	☐	50
other _____	☐	

3. Time spent developing well 90.0 min.

4. Depth of well (from top of well casing) 17.7 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 7.0 gal.

7. Volume of water removed from well 35.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added N/A

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	10.79 ft.	10.92 ft.
Date	b.	08/12/96	08/12/96
Time	c.	10:00 ☒ a.m. ☐ p.m.	11:30 ☒ a.m. ☐ p.m.
12. Sediment in well bottom		0.0 inches	0.0 inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Brown, cloudy	Clear ☐ 20 Turbid ☒ 25 (Describe) Slightly brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Additional comments on development:

Well developed by: Person's Name and Firm

Name: Josh Babiasz

Firm: Key Environmental

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Josh Babiasz /DNC

Print Initials: J B

Firm: KEY ENVIRONMENTAL SERVICES, INC.

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County	Well Name
Cottage Grove Citgo Quick Mart	Dane	MW-6
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
	13	_ _ _ _ _ _ _ / _ _ _

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☒	10
pumped only	☐	51
pumped slowly	☐	50
other _____	☐	

3. Time spent developing well 90.0 min.

4. Depth of well (from top of well casing) 17.7 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 7.0 gal.

7. Volume of water removed from well 45.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added N/A

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	10.76 ft.	10.79 ft.
Date	b.	08/12/96	08/12/96
Time	c.	10:00 ☒ a.m. ☐ p.m.	11:30 ☒ a.m. ☐ p.m.
12. Sediment in well bottom		0.0 inches	0.0 inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Brown, cloudy	Clear ☐ 20 Turbid ☒ 25 (Describe) Slightly brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Additional comments on development:
Definite odor (well in median)

Well developed by: Person's Name and Firm

Name: Zoy Begos

Firm: Key Environmental

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Zoy Begos/DNG

Print Initials: Z B

Firm: KEY ENVIRONMENTAL SERVICES, INC.

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.